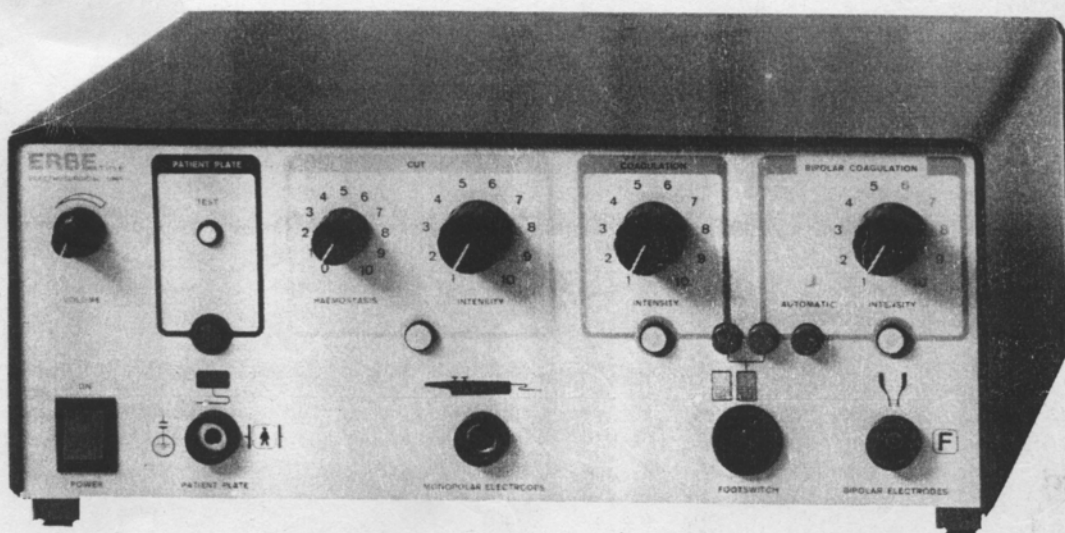


ERBE

ERBOTOM T 175 E

ELECTROSURGICAL UNIT

OPERATING INSTRUCTIONS



ERBOTOM T 175 E
ELECTROSURGICAL UNIT
OPERATING INSTRUCTIONS

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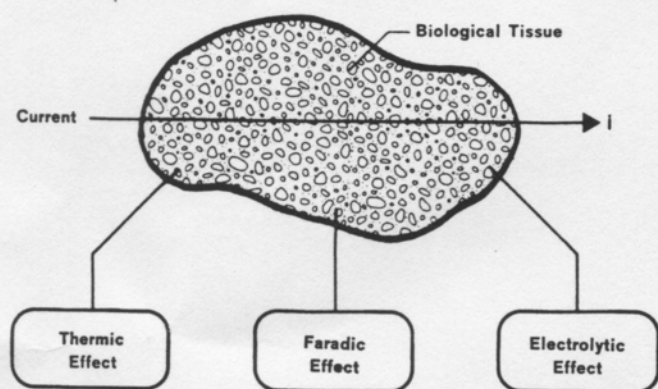
INTRODUCTION

CAUTION

This unit has hazardous electrical outputs. This equipment is for use only by qualified medical personnel.

Principles of Electrosurgery

When electric current flows through biological tissue the following effects can be observed:



The Thermal Effect

The tissue is heated by the electric current, in which the heating is dependent on the specific resistance of the tissue as well as on the current density and duration of application.

The Faradic Effect

Electrically sensitive cells, such as nerve and muscle cells, are stimulated by electric current. This effect, called faradic effect, is undesirable when performing radio-frequency surgery and a way of avoiding it has been devised. When an alternating current of sufficiently high frequency is used for electrosurgery, the faradic effect no longer occurs. This is the reason that an alternating current with a frequency of at least 300 000 Hz is used in what is henceforth referred to as high-frequency-surgery.

The Electrolytic Effect

Electric current causes ion shifts to occur in biological tissue. With direct current, positively charged ions would be shifted to the negative pole, the cathode, and the negatively charged ions to the positive pole, the anode, and their increased concentration at these points would cause electrolytic damage to the tissue.

When using alternating current of sufficiently high-frequency, the direction of movement of the ions is repeatedly reversed in accordance with the frequency of the current, so that the ions virtually oscillate to and fro at the frequency of the electric current. This is also a reason for the use of high-frequency alternating current in electrosurgery.

Use of the Thermal Effect in Electrosurgery

There are four different possibilities to apply the thermal effect of high-frequency current flowing through the tissue in electrosurgery:

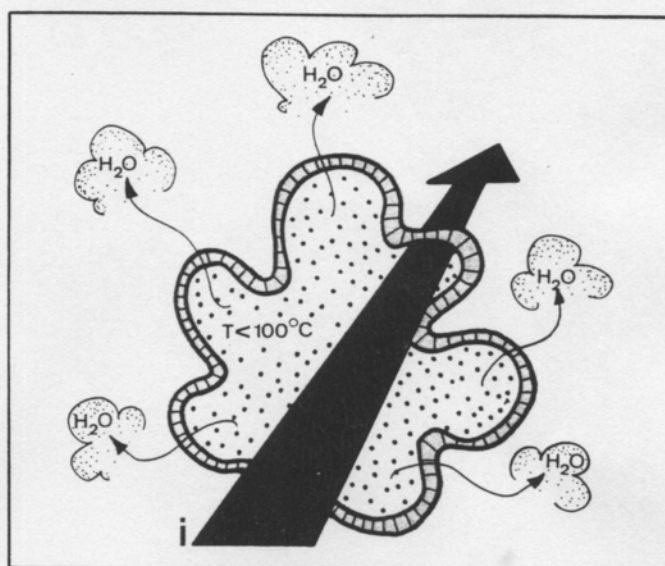
Electrosurgical Desiccation

Bipolar Coagulation

Electrosurgical Fulguration

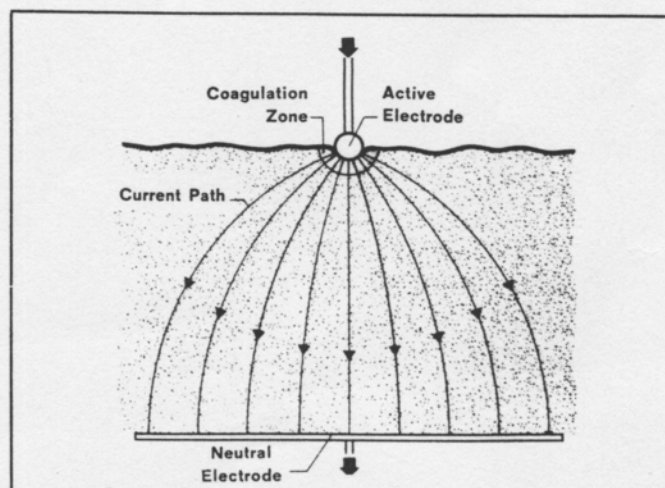
Electrosurgical Cutting

Electrosurgical Desiccation is known as a technique in which the active electrode is held in surface contact with, or inserted into, the tissue, for the purpose of dehydration or deliberate destruction of the tissue.

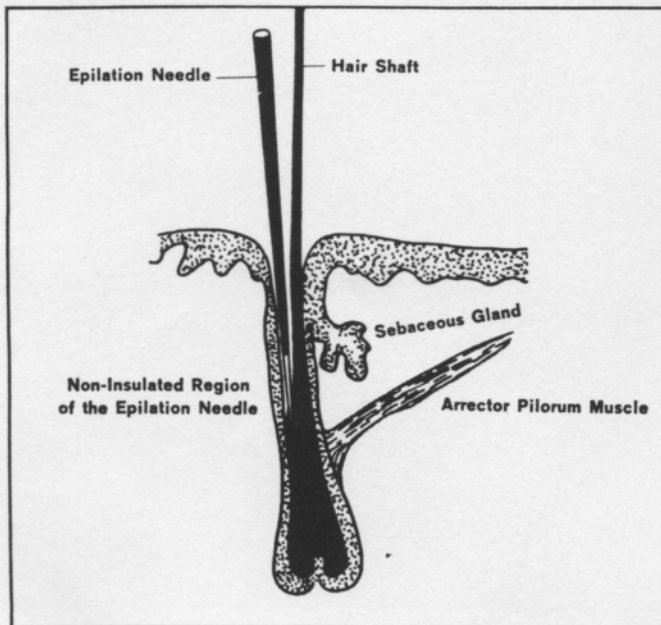


When the high frequency current i is flowing through the tissue, the cells become hot ($T < 100^{\circ}\text{C}$) and the water (H_2O) is slowly driven out of the cells of the tissue and the cells plasma coagulates.

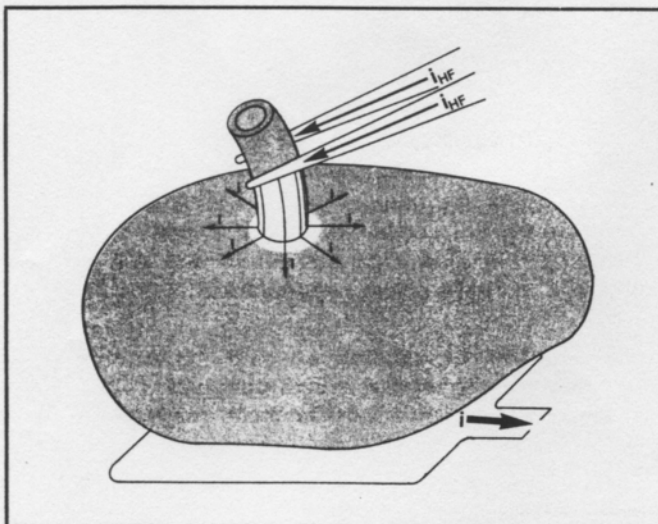
Electrosurgical Desiccation can be made monopolar with a special monopolar active coagulation electrode, i. e. a ball electrode, a surface electrode which is held in surface contact with the tissue.



Electrosurgical Desiccation can be made monopolar with a needle electrode which is inserted into the tissue during desiccation.



Electrosurgical Desiccation can be made also with monopolar coagulation forceps or by touching a clamp forcep with the monopolar active cutting electrode, so that the high frequency current i flows through the tissue.

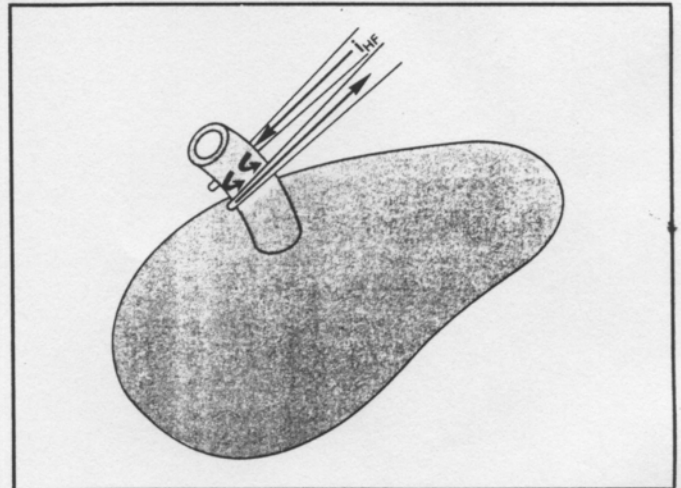


For monopolar electrosurgical desiccation a patient plate (also known as neutral, dispersive, indifferent or return electrode), is used to provide a return path for the high frequency current without physiological or physical effects are essential.

NOTE: To avoid cutting when desiccation is made with a cutting electrode (knife, wire-snare, band-snare, TUR-snare or needle electrode) pulse modulated high frequency current is required which is known as Electrosurgical Coagulation Current.

BIPOLAR COAGULATION

Electrosurgical Desiccation can also be made in the bipolar technique. For this bipolar technique special bipolar forceps are required.

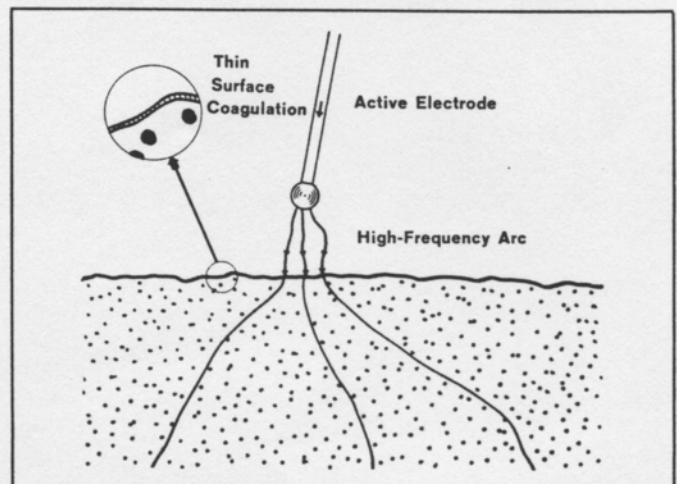


Bipolar Coagulation Using Bipolar Coagulation Forceps. The RF current i_{RF} flows into one blade of the coagulation forceps, then flows through the tissue to be coagulated into the other blade of the coagulation forceps and back to the current source, the electrosurgical unit. Bipolar coagulation produces defined localizable coagulation zones.

NOTE: No patient plate is used and isolation from earth at operating frequency is necessary for bipolar operation.

ELECTROSURGICAL FULGURATION

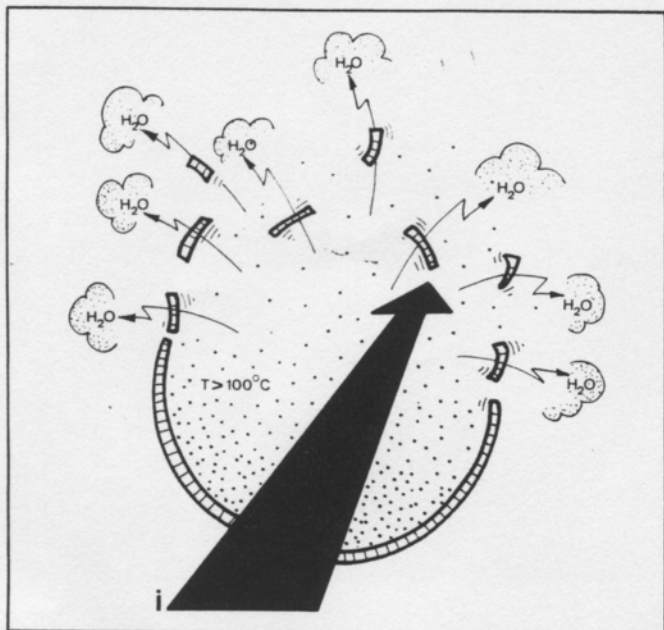
is known as the coagulation of the surface of tissue or blood by means of high frequency current sparks from the monopolar active electrode against the surface of the tissue. In contrast to electrosurgical desiccation, the active electrode is not in contact with the tissue.



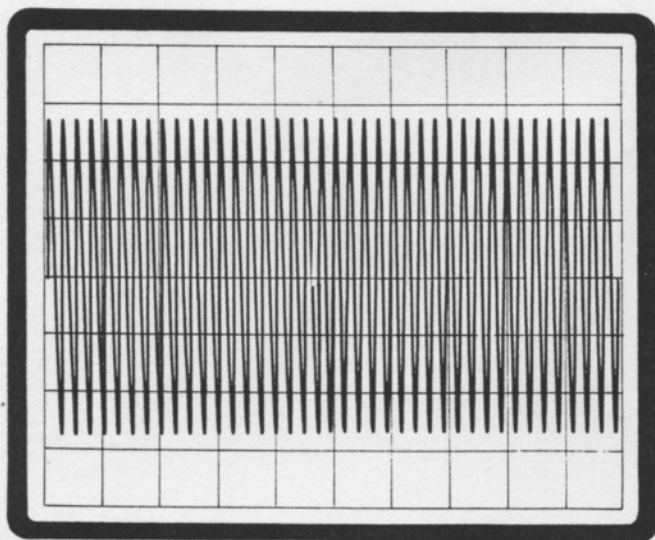
Fulguration is capable of surface coagulation.

ELECTROSURGICAL CUTTING

In electrosurgical cutting the objective is to heat the tissue so rapidly that cells explode into steam leaving a cavity in the cell matrix. The heat is dissipated in the



steam and therefore it does not conduct through the tissue or dry out adjacent cells. When the electrode is moved and fresh tissue is contacted, new cells are exploded and the incision is made.



The general characteristic of the high frequency current for cutting is that it is continuous sinewave.

For Some surgical procedures pure cutting, for other cutting with more or less hemostasis is desired by the surgeon. There are different possibilities for the surgeon to influence the degree of hemostasis during cutting tissue:

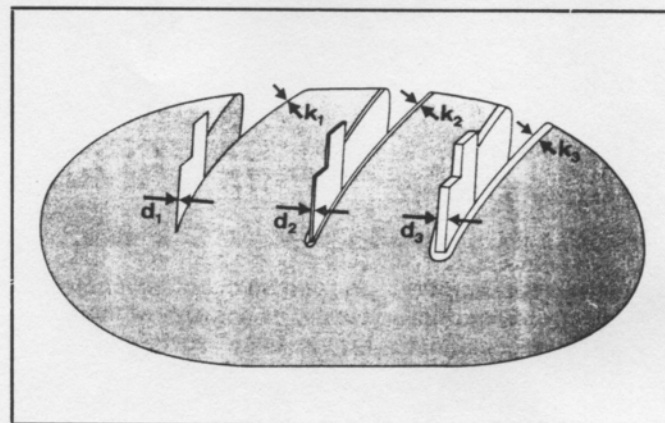
- THE SHAPE OF THE CUT ELECTRODE USED
- THE SPEED AT WHICH THE INCISION ELECTRODE IS USED TO CUT THROUGH THE TISSUE
- THE INTENSITY OF THE HF-CURRENT OR HF-POWER

● THE TISSUE PROPERTIES

● THE CHARACTERISTIC OF THE HF CURRENT WAVEFORM

THE SHAPE d OF THE INCISION ELECTRODE USED

The thinner the incision electrode is, the less is the coagulation k at the surface of incision. A lancet-shaped incision electrode, for example, produces greater coagulation of the incision surfaces than a thinner incision

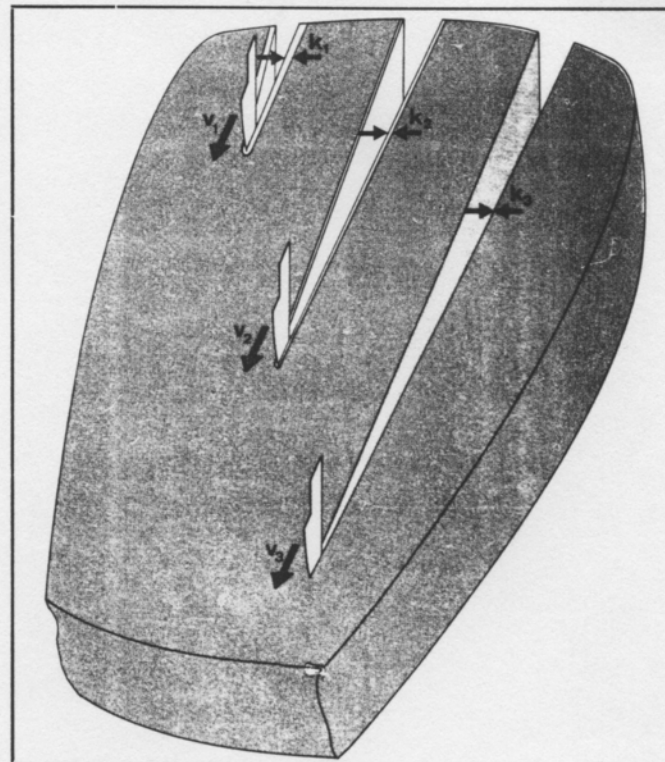


electrode. Examples of coagulation incision electrodes are: lancet electrode and needle electrode.

Examples of less-coagulating or non-coagulating incision electrodes are: tape loops or thin wire loop electrodes.

THE SPEED v AT WHICH THE INCISION ELECTRODE IS USED TO CUT THROUGH THE TISSUE

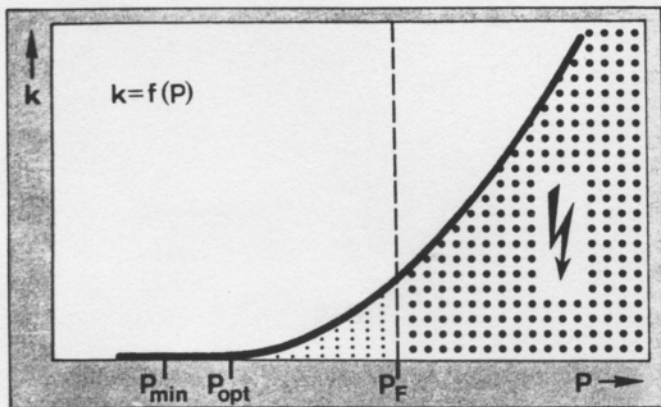
The degree of coagulation k of the incision surfaces is also dependent on the speed v with which the incision



is made. The slower the incision electrode is directed through the tissue, the greater is the degree of coagulation of the surfaces of the section.

THE INTENSITY P OF THE HF-CURRENT OR HF-POWER

When the intensity P is too low, $P_{\min} < P_{\text{opt}}$, the incision can only be made slowly. Coagulation of the surfaces of incision is then relatively pronounced. When the



intensity is too great $P > P_F$, sparks occur between incision electrode and tissue which, as a result of their high temperature, coagulate the incision surfaces to the point of burning. The optimum intensity P_{opt} is that at which the degree of coagulation is at a minimum.

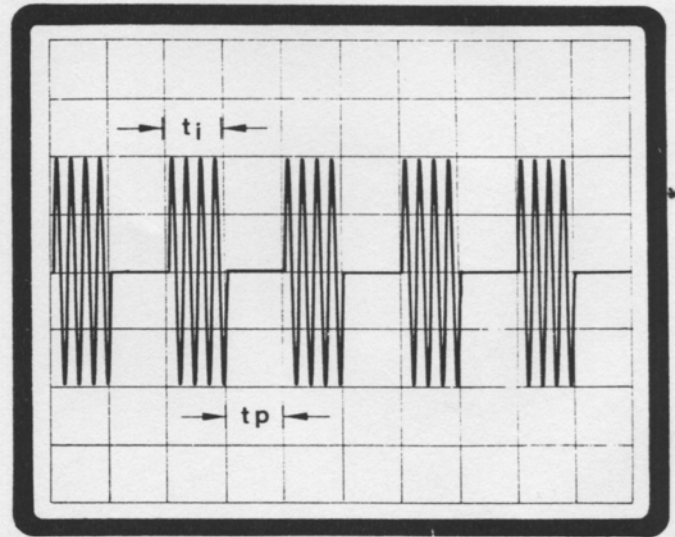
THE CHARACTERISTIC C OF THE HF CURRENT WAVEFORM

The degree of coagulation k of the surfaces of the section during incision can be influenced by modulating the amplitude of the RF current. The degree of coagulation increases with the degree of modulation. The degree of modulation can be mathematically described by the crest factor C . Here, the crest factor C is the ratio of the peak value of the current I_p (= maximum amplitude) to the root-mean-square value of the current I_{rms} .

$$C = \frac{I_p}{I_{\text{rms}}}$$

Blended Cut Principle

As one might expect, the BLEND is a cutting waveform with moderate hemostatic effect. That is, the walls of the incision made with the BLEND current will be well coagulated, depending on the duration of the pauses t_p between the COAG bursts t_i which can be chosen by means of the CUT HEMOSTASIS DEGREE ADJUSTMENT on the T 400 C surgical equipment.

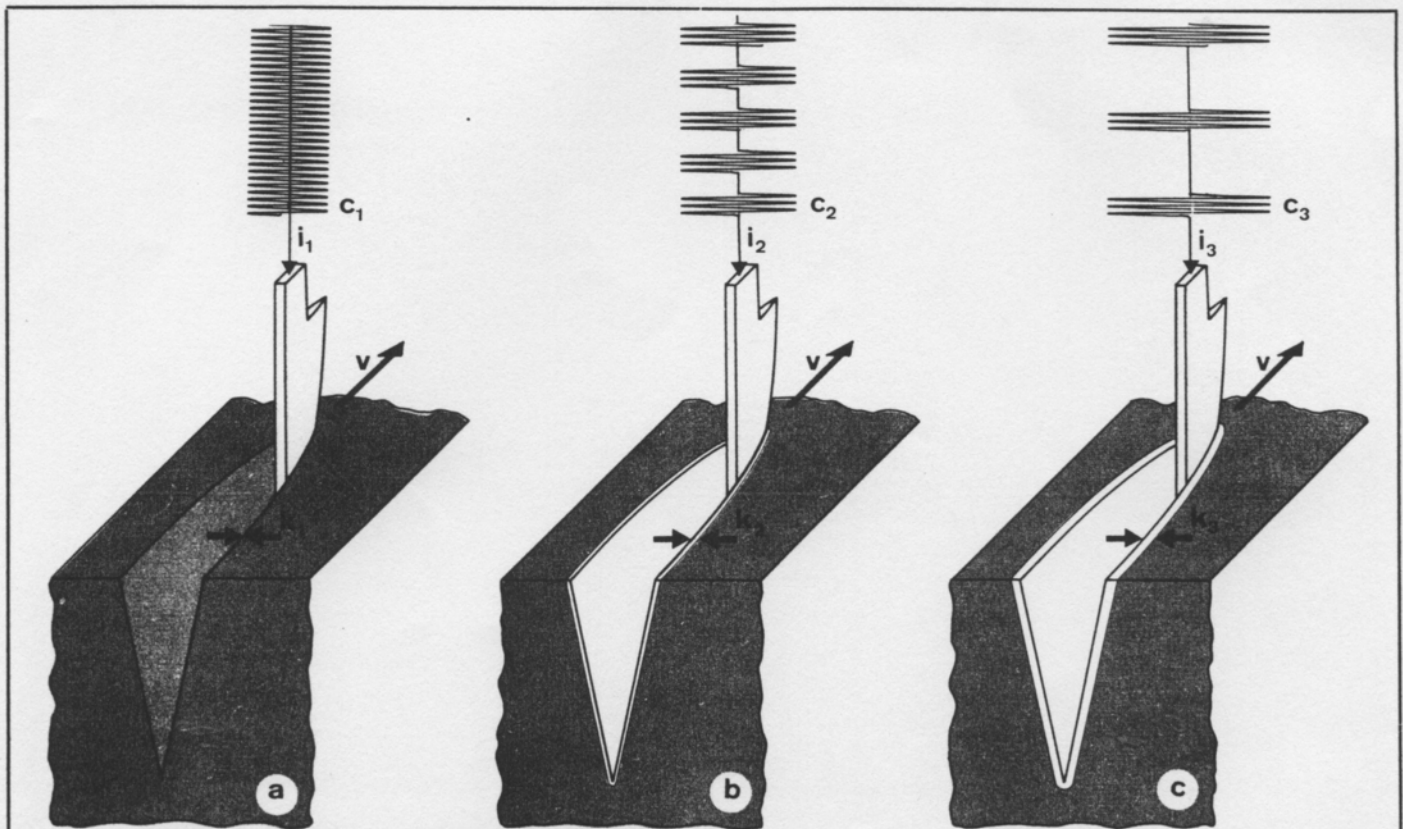


The essential characteristic of a blended cut waveform is that it is a pulse modulated RF-current.

THE TISSUE PROPERTIES

In the case of tissue with a high water content, the coagulation of the incision surfaces is less than with drier tissue.

By a combination of these five parameters, the surgeon can vary the degree of hemostasis during cutting tissue between wide limits.



DESCRIPTION OF THE ERBOTOM T 175 E UNIT

The ERBOTOM T 175 E high-frequency electrosurgical unit is equipped with two independent high-frequency generators. One generator can produce up to 175 Watts RF power for monopolar techniques such as cutting with knife or wire electrodes, coagulation with ball electrodes etc. The other generator produces up to 50 Watts RF power for bipolar techniques such as bipolar coagulations with bipolar forceps, laparoscopic tubal sterilizations etc.

The provision of independent RF generators for monopolar and bipolar outputs offers the following advantages:

- The adjustment of the outputs is totally independent.
- RF power is supplied only to the active electrode which is actuated, preventing accidental injuries that otherwise might be caused by unused electrodes.
- The bipolar output can be used without connecting the dispersive electrode (patient plate) to the unit. The safety circuit of the patient plate is operational only when utilizing the monopolar output.
- The independent bipolar generator allows bipolar operation without generating more RF power than necessary. The unit is not heated unnecessarily, no unneeded large amount of disturbance power is generated, and the danger of applying an erroneously high dosage is minimized.

For monopolar techniques, two different currents can be preset on the unit. One current for cutting with a variable degree of HEAMOSTASIS to arrest minor blood flow and oozing from small vessels. A second, independent current allows COAGULATION of larger vessels by means of clamp or coagulation electrodes.

High-frequency current may be activated by means of:

- hand control with one or two push-buttons,
- footswitch with one or two pedals also
- the bipolar generator can be activated by footswitch or by using the automatic switching on system. This system switches on the high-frequency current automatically after the forceps and the tissue have been in contact continuously for 2 seconds as adjusted on the unit, but this delay time period can also be preset from zero to five seconds. This allows the surgeon time to position the forceps and prepare the tissue before coagulation is initiated. The automatic control system operates with coagulation forceps of every shape and manufacture.

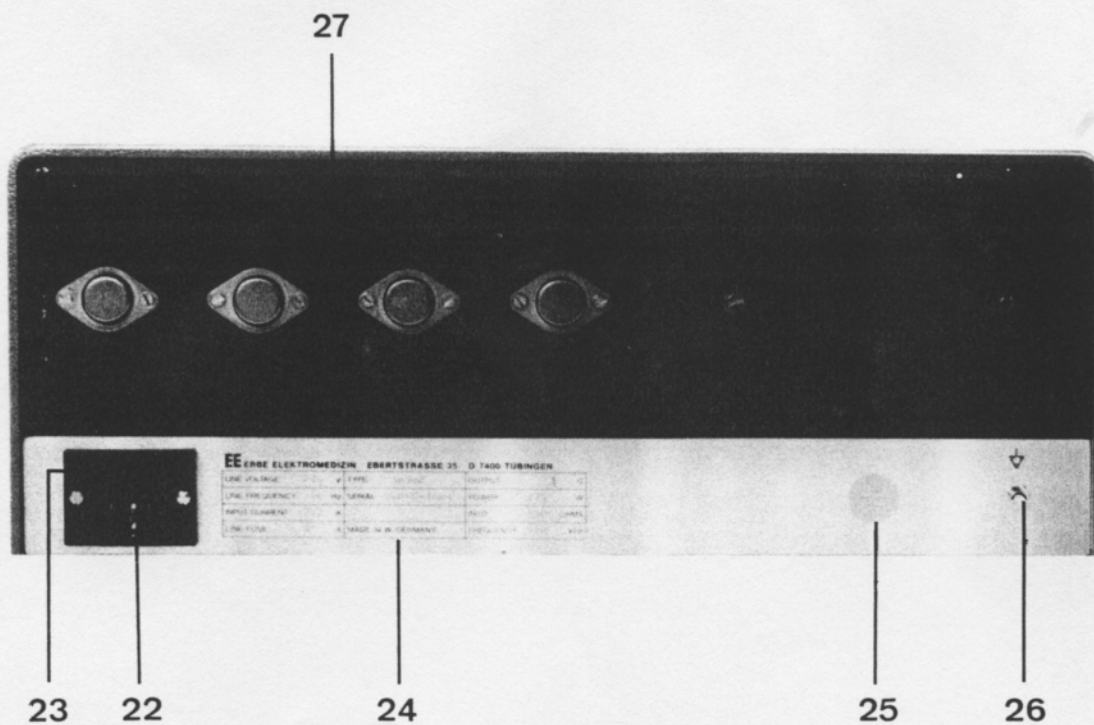
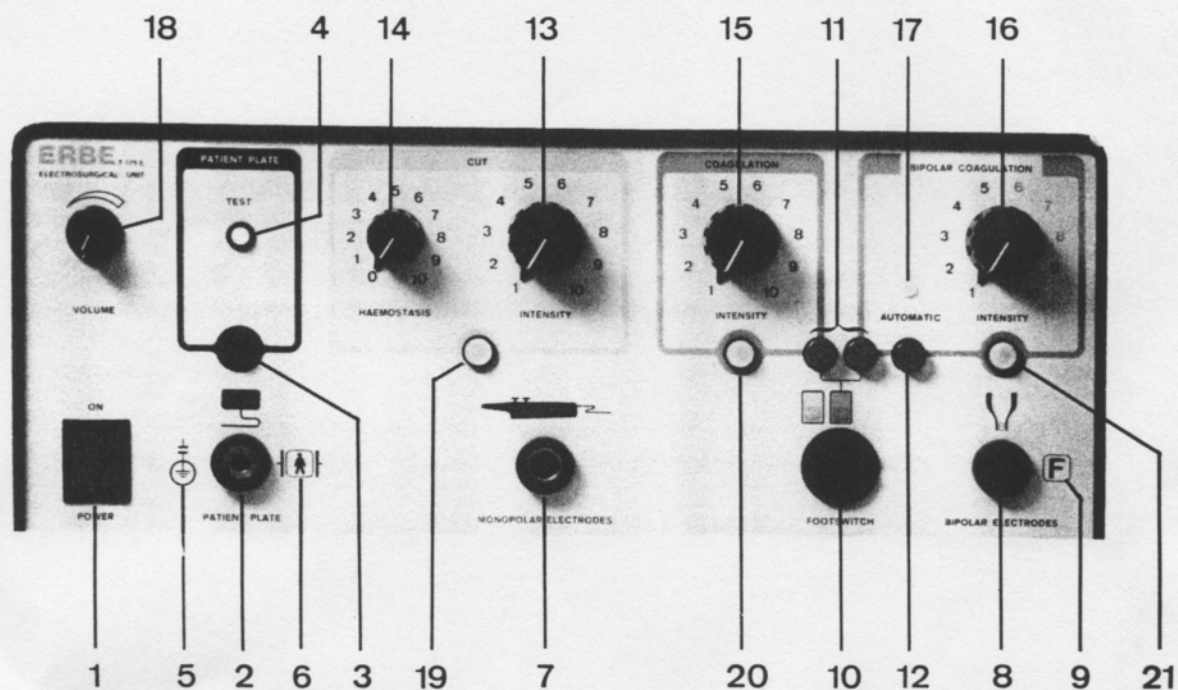
The output characteristics of the ERBOTOM T 175 E allow the generated RF power to achieve maximum effectivity at the active electrode while maintaining great flexibility (automatic power matching to the contact surface between tissue and active electrode).

The safety circuit of the patient plate automatically monitors the continuity of the electrical connection between the patient plate and the unit whenever the monopolar output is in use. To prevent accidental injuries, any interruption of the continuity cuts off the monopolar power output and signals this fault visually by a red pilot lamp and audibly via a distinct tone.

The patient plate of the ERBOTOM T 175 E can be conductively grounded, earth referenced via a capacitor or can be a floating output.

Haemostasis during cutting is smoothly adjustable. With coagulation during cutting it is possible to stop bleeding from small vessels immediately.

The ERBOTOM T 175 E produces two different tones adjustable in volume to synchronize with the RF power output for cutting and coagulation. This provides great assistance to the surgeon during an operation when he is unable to observe the unit.



- ① Power Supply Switch. After switching on the power supply switch the ERBOTOM T 175 E is immediately ready to operate.

ATTENTION: The ERBOTOM T 175 E should only be operated from a properly installed socket which has protective plug reception.

The pilot lamp in the power supply switch indicates that the ERBOTOM T 175 E is ready for use. If this pilot lamp goes out even though the power supply switch is switched on, there is either no supply voltage or the power line fuse 23 in the unit is defective.

- ② Connection for the patient plate. The ERBOTOM T 175 E is equipped with a safety circuit which monitors continuity of the connection between the unit and the patient plate. If this connection is interrupted, the monopolar RF generator for incisions and coagulation cannot be switched on.

The bipolar RF generator, however, can be used independently of whether the patient plate is connected to the unit or not.

- ③ This red pilot lamp lights up and an audible alarm signal sounds when the attempt is made to switch on the monopolar RF generator for incisions or coagulation by means of the push-button or footswitch, when the connection between the unit and the patient plate is interrupted.

- ④ Test button. A check on the connection between the unit and the patient plate can be made at any time by pressing this button. If there is a fault, it is signalled by the red pilot lamp 3 and an audible alarm signal.

The function of the safety circuit can also be checked by pressing this TEST button. If the plug of the patient plate is not inserted into socket 2, the red pilot lamp 3 must light up and the audible signal must sound when the TEST button is depressed.

- ⑤ The standard ground connection for the patient plate of the ERBOTOM T 175 E is via a capacitor (ground wire potential), which conforms to design type BF according to IEC 601-1 requirements.

- ⑥ This symbol indicates that the patient circuit of the ERBOTOM T 175 E is defibrillation-safe, which means that the patient plate of the ERBOTOM T 175 E can remain applied to the patient during defibrillation.
- ⑦ Connection for monopolar active electrodes. Monopolar active electrodes for incisions and coagulation are connected to this socket. When electrode holders with two buttons are used, this connection can be used to switch on both the RF current for incisions and the RF current for coagulation.
- ⑧ Connection for bipolar electrodes. The ERBOTOM T 175 E unit is equipped with an RF generator specially developed for bipolar coagulation and which can be used completely independently of the RF generator for monopolar application. The RF power of this generator can be continuously and finely adjusted up to a maximum of 50 Watts.

Compared with units in which the RF power for bipolar coagulation is derived from the same RF generator which provides the RF power for monopolar applications, this separate RF generator for bipolar coagulation has the following advantages:

During bipolar coagulation, the monopolar outputs including the connection of the patient plate remain completely free of RF power. This ensures the prevention of monopolar fault currents from or to the bipolar electrode.

Bipolar coagulations can be carried out irrespective of whether a patient plate is connected to the unit and the patient or not. Appropriate triggering of the automatic safety circuit for the patient plate only occurs when the monopolar generator is in use.

Where monopolar as well as bipolar electrodes are connected to the unit at the same time, the particular electrode not used is completely without power. This prevents the danger of any unused electrode from accidentally touching and respectively injuring or damaging patients, personnel or materials. The bipolar generator can be actuated either by footswitch (when the right-hand blue button 11 is depressed) or completely automatically via the bipolar electrode (when the gray button 12 is depressed). For automatic actuation, any bipolar electrode can be used - irrespective of shape or manufacture.

Automatic actuation of the bipolar generator is initiated when both surfaces of the bipolar electrode simultaneously touch the tissue to be coagulated. According to requirements, a time delay from 0 to 5 seconds between the touching of the tissue and the switching on of the coagulation current can be set. This provides the surgeon with the facility of using the bipolar coagulation electrode, bipolar tweezers or forceps, for holding or freely preparing the tissue to be coagulated prior to coagulation without the tissue being immediately coagulated. The bipolar coagulation current is only actuated when the tissue is touched with the bipolar coagulation forceps continuously for the entire delay period set. Direct contacts of less time than the set time delay can be repeated as often as required without the bipolar coagulation current is being switched on.

- ⑨ This symbol means, the bipolar output is insulated against ground i.e. floating.
- ⑩ Connection for footswitch. The footswitch with two pedals is connected to this socket. The left-hand yellow pedal will switch on the RF current for incisions, while the right-hand blue pedal will switch on the RF current either for monopolar or bipolar coagulation depending on whether the left-hand blue button or the right-hand blue button 11 is depressed.
- ⑪ Selector buttons. When the left-hand blue button is depressed the blue footswitch pedal will switch on the current for monopolar coagulation.
When the right-hand blue button is depressed the blue footswitch pedal will switch on the current for bipolar coagulation.
- ⑫ When this button is depressed the bipolar coagulation current is automatically switched on when, for example, both tips of the bipolar coagulation forceps simultaneously and continuously touch the tissue to be coagulated.
When this button is depressed a small pilot lamp (17) above the button lights up to indicate that the automatic bipolar actuation is ready to operate.

- ⑬ Adjusting the power for incisions. Via this control the intensity of the RF current or RF power for incisions can be adjusted continuously. The RF current for incisions may be set for low-coagulation, smooth incisions as well as for coagulated incisions which arrest the blood flow at the incision surfaces.
- When ball or plate electrodes are in use, the degree of coagulation has to be set at 0, since the intensity of coagulation depends in this case on the average RF power, the shape of the electrode and duration of current flow.
- ⑭ Adjusting the degree of coagulation. The degree of coagulation of the incision surfaces can be influenced by modulating the amplitude of the RF current (see page 6).
- ⑮ Adjusting the RF power for coagulation of larger bleeding vessels during cutting is possible since the RF power for incisions can be directly switched over to coagulation either by using the hand control or the footswitch without even having to change the electrode. Thus when touching the bleeding vessels with the electrode for incisions and shortly switching on the RF current for coagulation the bleeding vessels will be coagulated.
- ⑯ Adjusting the RF power for bipolar coagulation continuously and finely up to maximum of 50 Watts.
- ⑰ This pilot lamp lights up when the automatic bipolar actuation is ready to operate.
- ⑱ Volume control. During actuation of the monopolar and bipolar generators, the ERBOTOM T 175 E emits an audible signal in order to indicate that RF power is actuated. The loudness of the signal can be individually adjusted by means of this control.
- ⑲ This pilot lamp lights up when the RF current for incisions is switched on.

- (20) This pilot lamp lights up when the RF current for coagulation is activated.
- (21) This pilot lamp lights up when the RF generator for bipolar coagulation is ready to operate.
- (22) Power connection. The ERBOTOM T 175 E must only be connected to a properly earthed socket supplying the voltage stated on the equipment name plate.
- Connection to the power supply must only be made by means of power cable supplied by the manufacturer of the equipment or cable of corresponding quality. This also applies to any extension cables and distribution sockets which might be used.
- (23) Power-line fuses. The ERBOTOM T 175 E is protected with two power-line fuses of 4 A, medium-delayed action, 5 x 20 mm. If either one or both fuses blow, a technician authorized by us should inspect the equipment before new fuses are fitted.
- (24) Name plate. In the case of complaints, requests for servicing etc., please quote the type number and serial number stated on the plate.
- (25) Red spot. **WARNING:** This unit must not be operated in areas where there is an explosion hazard. During electrosurgery, sparks between the active electrode and the tissue are unavoidable. These sparks can ignite flammable or even explosive agents.
- (26) Potential equalization. If this electrosurgical unit is used for cardiac or brain surgery, the unit should be connected to the potential equalization busbar of the operating theater by means of the potential equalization cable supplied. The connection should be identified with the following symbol:



- ②⑦ The heat sink on the rear panel should not be covered up during operation otherwise overheating may occur.

Therefore, when setting up the unit care should be taken to leave the heat sink uncovered so the air can freely circulate.

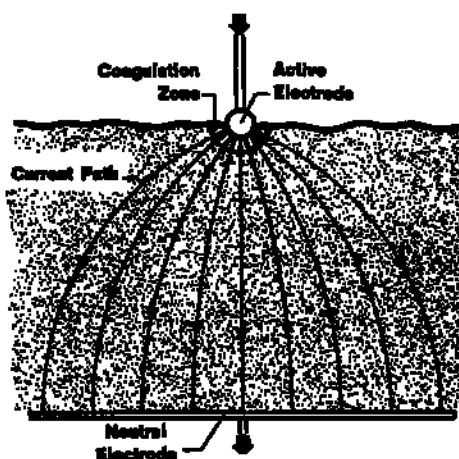
IMPORTANT INFORMATION ON ELECTROSURGERY

Application of the Patient Plate



Essential prerequisites for satisfactory electrosurgery are that the patient plate, including cable and plug, are in perfect condition and that the patient plate is correctly applied to the patient.

The entire RF current, which flows into the patient via the monopolar active electrode, must be conducted away from the patient via the patient plate in order to flow back to the surgical equipment via the patient plate cable.

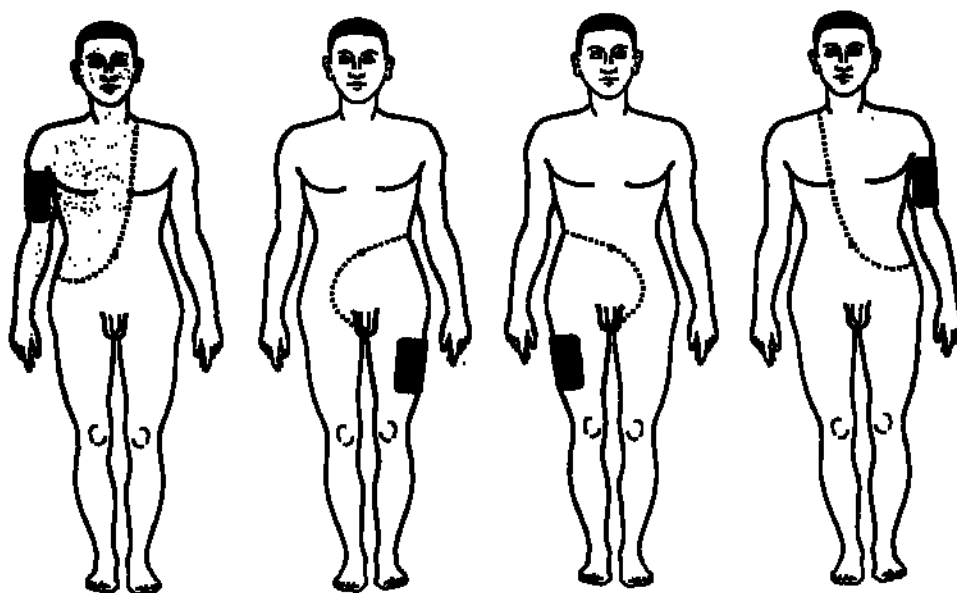


If fixing the patient plate to the patient is forgotten or incorrectly carried out, the current will flow from the patient to electrically conductive objects, such as operating tables, supports, parts of other equipment, damp swabs, etc., in which the current density can be so great as a result of the relatively small contact surfaces that burns to the patient may occur.

The Following Instructions Regarding the Application of the Patient Plate must be observed:

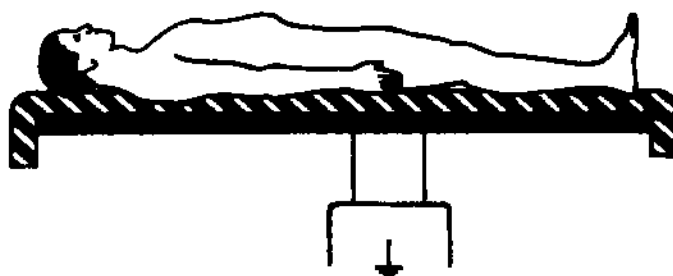
- **The patient plate including cable and plug must always be in perfect condition.** Above all, care should be taken to ensure that the surface of any reusable patient plate is clean and metallically bright.
- **Careful consideration should be given to the positioning of the electrodes and their connections.** The high-frequency current path through the patient must be as short as possible. Therefore the patient plate should be positioned with its entire area covering the patient as close as possible to the operating area.

The diagram shows the most suitable points of application on the upper arms or thighs for the appropriate operating areas.



- **Do not apply the neutral electrode to bony or hairy areas.** Hairy areas should be shaved off before application.
- **The electrical conductivity of the skin** in the area of the patient plate should be improved by cleaning away oil and grease, massaging or brushing to improve the circulation and by carefully rubbing in saline solution.

- Do not attach the patient plate directly over large blood vessels close to the skin. Attach the patient plate securely, so that even when the patient moves the whole fixture area is secure. Make sure that there is no excessive contusion which could lead to necrosis resulting from lack of circulation.
- Areas subject to considerable secretion of sweat, body extremities lying against the trunk or skin-to-skin contacts should be separated by the application of dry cloth. Drain off urine with a catheter.
- During electrosurgery, the patient must not come into contact with electrically conductive objects, such as the operating table, supports, damp cloth etc.



A thick, dry, electrically-insulating sheet must be placed between the patient, the operating table and the supports. During electrosurgery, these sheets must not become damp.

- If the patient is connected to a monitoring device during electrosurgery, the ECG electrodes should not be applied too close to the operating area. The distance should be at least 15 cm. Instrument leads which can conduct the RF current away from the patient must not be applied to the patient during electrosurgery.

WARNING! In the floating mode the neutral ECG electrode must not be connected to the neutral surgical electrode, but should be placed as far as possible away from it.

- The cable between the patient plate and the surgical unit must be as short as possible.

- The function of the safety circuit for the patient plate must be checked before every operation. This can be carried out quite simply by pressing the TEST button. If the patient plate is not connected to the unit or if the electrical connection between the unit and the patient plate is defective, the red pilot lamp will light up and an alarm signal sounds.

If the electrical connection between the unit and the patient plate is in order, the unit will not sound an alarm signal and the red pilot lamp will not light up when the TEST button is depressed.

Optimum RF power

The optimum RF power is the power at which the desired effect, e.g. incisions or coagulation, is best achieved and the undesirable effects, e.g. carbonization, burns, sparking, are minimal.

It also depends on many parameters, e.g. shape of the active electrodes, tissue characteristics, individual working technique of the surgeon etc.

Since almost all undesirable side-effects such as carbonization of the tissue, danger of burns to the patient, sparking, destruction of fine active electrodes etc. are observed in the case of excessively high RF power, the attempt should always be made to reduce the RF power to a bare necessity.

CAUTION

If the desired effect is suddenly not achieved using the empirically determined optimum RF power, a check should be made for faults before increasing the RF power, e.g.:

Is the patient plate properly connected?

Is the active electrode properly connected?

Is the active electrode clean?

Is the surgical unit correctly adjusted?

● UNINTENTIONAL ACTIVATION OF THE HF-GENERATOR

WARNING: Unintentional activation of the high-frequency generator can lead to patient burns when the active electrode touches the patient directly or indirectly through electrically ductile objects or wet cloths.

Unintentional activation of the high-frequency generator can be caused for example by:

- unintended pressing of a footpedal
- unintended pressing of a button on the electrode handle
- short circuit within a cable to the electrode handle with push buttons or to the footswitch
- penetration of electrically ductile fluids into a finger switch, into an electrode handle or into a footswitch. Electrically ductile fluids are for example blood, amniotic fluid (special care is called for in cesarean section, see under point 1), urine, physiological saline, irrigation fluids etc.
- defects within the high-frequency surgical unit

In order to avoid patient burns due to unintended activation of the high-frequency generator, the following rules of application must be observed:

1. Never place active electrodes on or beside the patient in such a way that the electrodes can touch the patient directly or via electrically ductile objects or wet cloths.
2. The acoustic signal which indicates the activation of the high-frequency generator must always be adjusted so that it can be heard.
3. In operations in which the cutting or coagulation electrode unavoidably remains in contact with the patient even in the unactivated state, e. g. in endoscopic operations, special care is called for. An electrode activated unintentionally owing to a mistake should not be removed without due precautions from the body. In removal of the activated electrode from the body of the patient, burns may arise at all areas within the body which come into contact with the activated electrode. For this reason, the mains switch of the high-frequency surgical unit must be turned off immediately before an attempt is made to remove the activated electrode from the body.

● UNINTENDED BURNS CAUSED BY HOT ELECTRODES

WARNING: Cutting and/or coagulation electrodes become hot indirectly from the heated tissue and from the electric arc during cutting and/or coagulation processes. Tissue may be unintentionally burned after cutting and/or coagulation when electrodes which are still hot have contact with the tissue. This is to be noted especially in endoscopic operations, for example in pelviscopic coagulation of the Fallopian tube or in endoscopic polypectomy.

Cardiac Pacemakers

If electrosurgery is used on patients with implanted cardiac pacemakers or pacemaker electrodes, then it must be realized that irreparable damage to the pacemaker and its function may occur and lead to ventricular fibrillation.

Fire and Explosion Hazards

In the use of electrosurgery, sparking at the active electrodes is unavoidable. Therefore, in those areas in which combustible or explosive substances are present, e.g. anaesthetics, skin-cleansing lotions, degreasants and disinfectants, also endogenous gases, e.g. in the gastro-intestinal tract, electrosurgery must not be used because of the danger of fire and explosion.

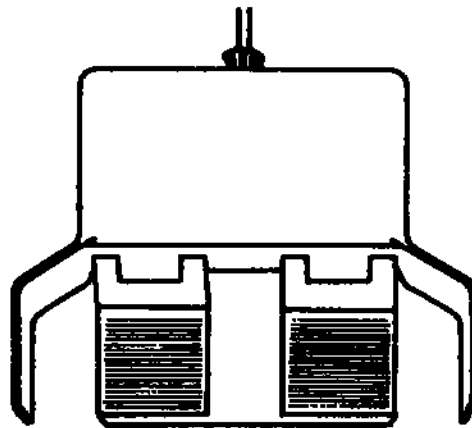


When using electrosurgery, the above substances must neither be combustible nor explosive, or at least be completely evaporated and removed from the area of sparking before switching on the electrosurgical unit.

SWITCHING ON THE RF CURRENTS

The ERBOTOM T 175 E unit can be actuated by footswitch, finger switches on the hand control and automatically for bipolar coagulations.

Footswitch



The yellow pedal can switch on the RF current for incisions and the blue pedal can switch on either the monopolar or the bipolar RF current for coagulation.

ATTENTION!

In areas where there is an explosion hazard, only explosion-proof footswitches must be used, e.g. Type 2 01 89-000 from ERBE ELEKTROMEDIZIN.

Finger Switches



The yellow button can switch on the RF current for incisions. The blue button can switch on the RF current for arresting blood flow or coagulation.

Automatic Actuation of the Bipolar Coagulation Current

The bipolar generator of the ERBOTOM T 175 E unit is equipped with an automatic switch-on system. On simultaneously touching the tissue to be coagulated with both forceps points, the automatic system switches on the bipolar coagulation current. In order to avoid, on the one hand, unintentional switching on in the case of accidental contact with the tissue and, on the other hand, to provide the surgeon with the facility of using the bipolar coagulation forceps to grip the tissue to be coagulated or to prepare it without coagulation immediately taking place, the ERBOTOM T 175 E automatic switch-on system is provided with an approx. 2 seconds switch on delay. Therefore the bipolar coagulation current is only switched on when both forceps points touch the tissue continuously for at least 2 seconds.

CLEANING, DISINFECTION AND STERILIZATION

Cleaning

Always switch off and disconnect the equipment from the power supply before cleaning. Enamelled parts must only be cleaned by wiping with a damp cloth and mild detergent, and rubbed down with a dry cloth. Normal cleaning can be done with water, but the electrodes should be stored dry.

Do not allow water or other liquids to enter the equipment as they may cause short circuits and corrosion.

The active electrodes must be kept clean while in use. Any blood or particles of tissue found adhering to them should be removed at once with the aid of sterile gauze or copper wool.

Reusable patient plates must always be kept bright and free from grease. Blood etc. may be removed with water and a mild abrasive. The plates must be rinsed thoroughly to remove all traces of abrasive. The patient plate and connecting cable must be maintained in perfect condition since bad conductivity or bad application of the plate to the patient, may cause burns.

Disinfection

Always switch off and disconnect the equipment from the power supply before disinfection. The equipment, accessories and connecting cables can be disinfected by wiping with a cloth dampened with glutar aldehyde fluid or an equivalent solution. Do not use solvent or corrosive disinfectants.

WARNING!

The equipment must not be exposed to gaseous disinfectants.

Spray disinfectants are not recommended as the disinfectant may enter the equipment causing short circuits or corrosion. If the room in which the equipment is installed is to be disinfected by means of an atomizer, the equipment should be carefully covered with plastic. The unit should be switched off and allowed to cool down well in advance, in order to prevent convection currents drawing the disinfectant spray into the equipment.

After disinfecting the room, remove the plastic cover from the unit and wipe the unit with disinfectant. The equipment may not be used in the presence of disinfectants which vaporize to form explosive mixtures and the vapor must be allowed to disperse before the equipment is being used again.

The method of disinfection used should comply with standard regulations and recommendations, including those concerning the prevention of explosion hazards.

Sterilization

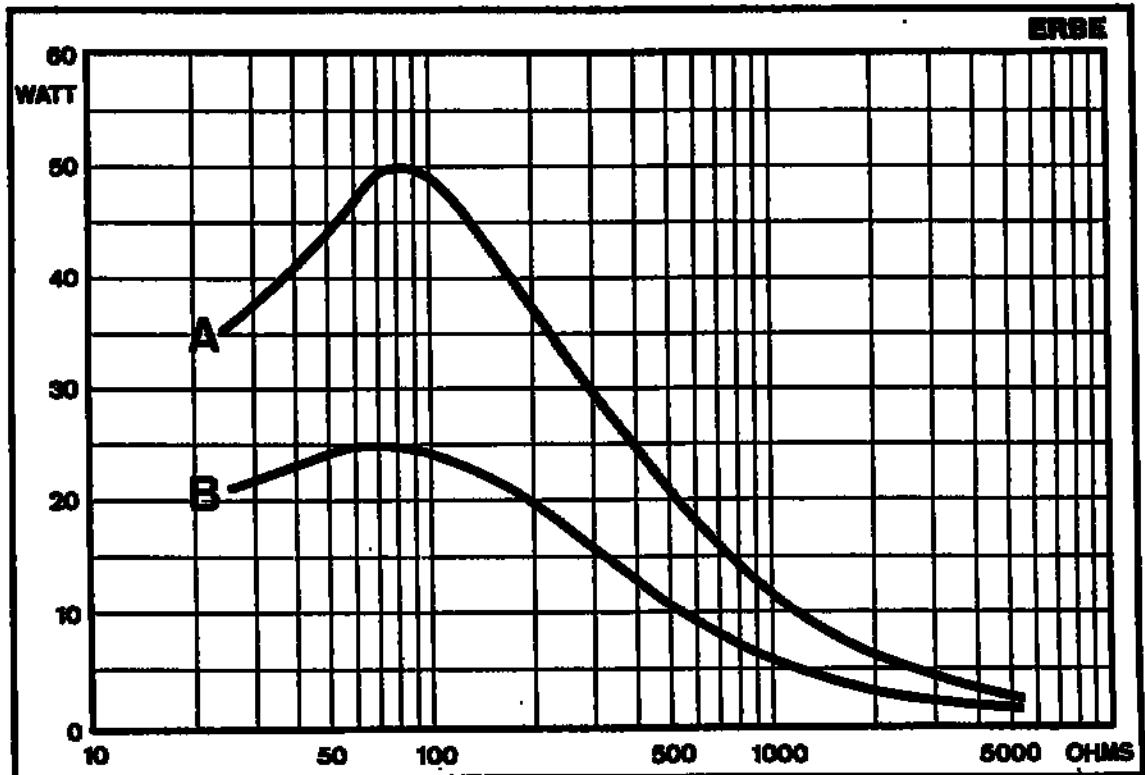
All monopolar and bipolar hand controls, forceps, electrodes, cables and reusable patient plates may be steam sterilized up to a temperature of 134°C, using standard practices. It is advisable to wrap hand controls and cables in cloth for steam sterilization, however, do not wrap too tightly otherwise damage may occur. After sterilization, the items should be removed from the cloth immediately and dried thoroughly before reusing for another operating procedure.

TECHNICAL SPECIFICATIONS

Mains	220 V \pm 10 %, 50 Hz other voltages and frequencies on request.
Power consumption: without RF output power by 175 Watts RF output power	7 Watts 345 VA
Leakage current	0.09 mA
Protection Class	I according to IEC 601-1 requirements
RF output monopolar cutting monopolar coagulation bipolar coagulation	175 Watts at 300 Ohms 100 Watts at 300 Ohms 50 Watts at 75 Ohms
Monopolar frequency Bipolar frequency	450 kHz 500 - 1000 kHz
Output power controls: Monopolar Bipolar Degree of coagulation Crestfactor: monopolar cutting	continuous from 1 to 10 continuous from 1 to 10 continuous from 0 to 10 continuous from 1.4 to 9.5
Patient plate Standard: alternatively:	grounded capacitively (type BF) grounded directly or as a floating output (type CF)
Low frequency leakage current 50 Hz	less than 2 μ A
Colour indications according to IEC 601-1: Cutting Coagulation	yellow blue
Audible signals: Cutting Coagulation Bipolar	continuous tone modulated tone continuous tone
Visual signals:	5 pilot lamps
Cooling	no fan, cooled by natural convection
Size	W x H x D = 405 x 170 x 300 mm
Weight	11 kilograms

GRAPHS

The following graphs show the nominal output of the HF surgical unit ERBOTOM T 175 E in dependence on load resistance, power setting and degree of coagulation. The actual output power may, in accordance with IEC 601 Part 2-2, deviate by $\pm 20\%$ from the nominal output power.



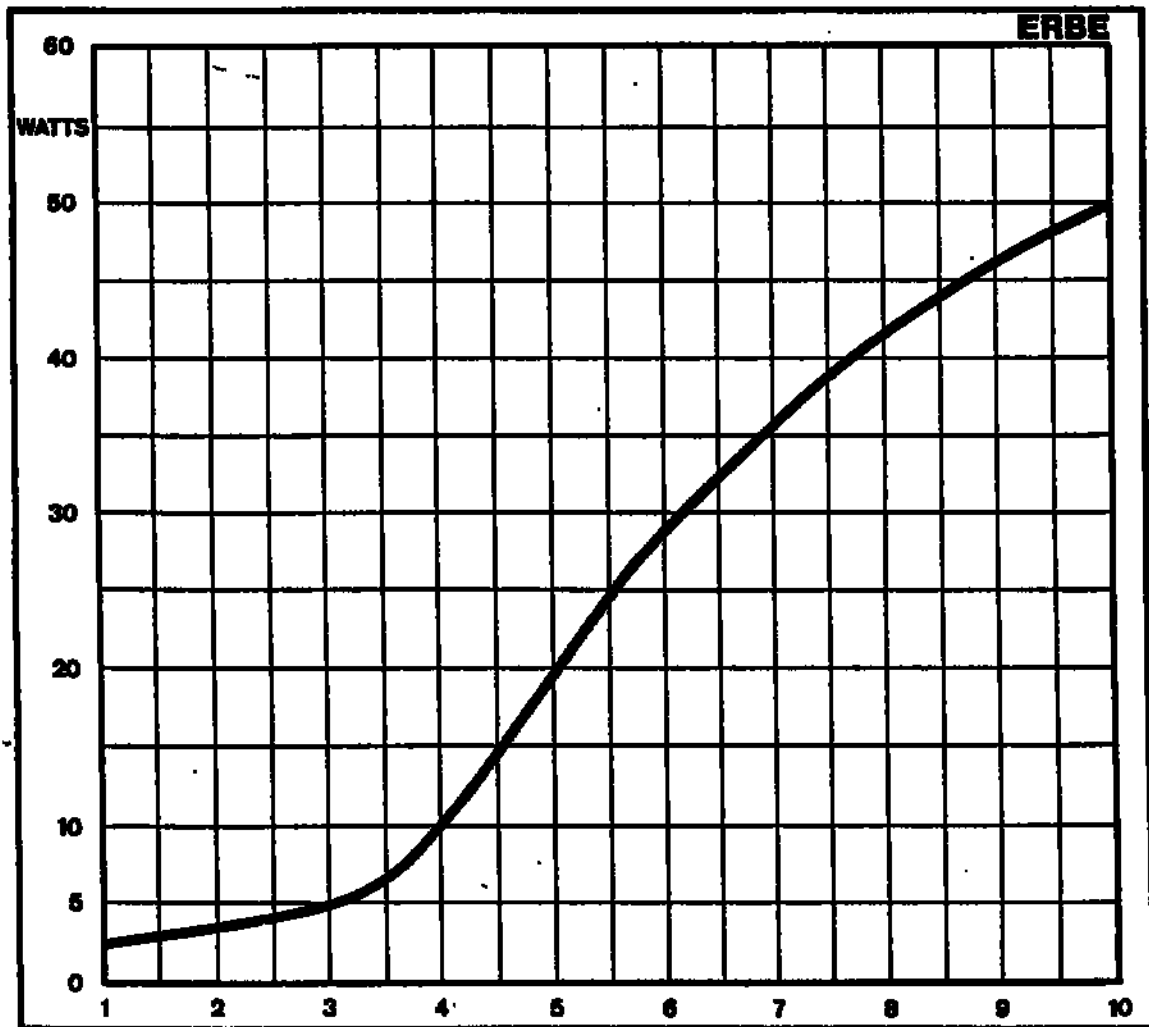
Graph 1 : Output power of the bipolar generator as a function of load resistance.

Curve A : Output power at power setting 10

Curve B : Output power at power setting 5

Equipment impedance is 75 Ohms

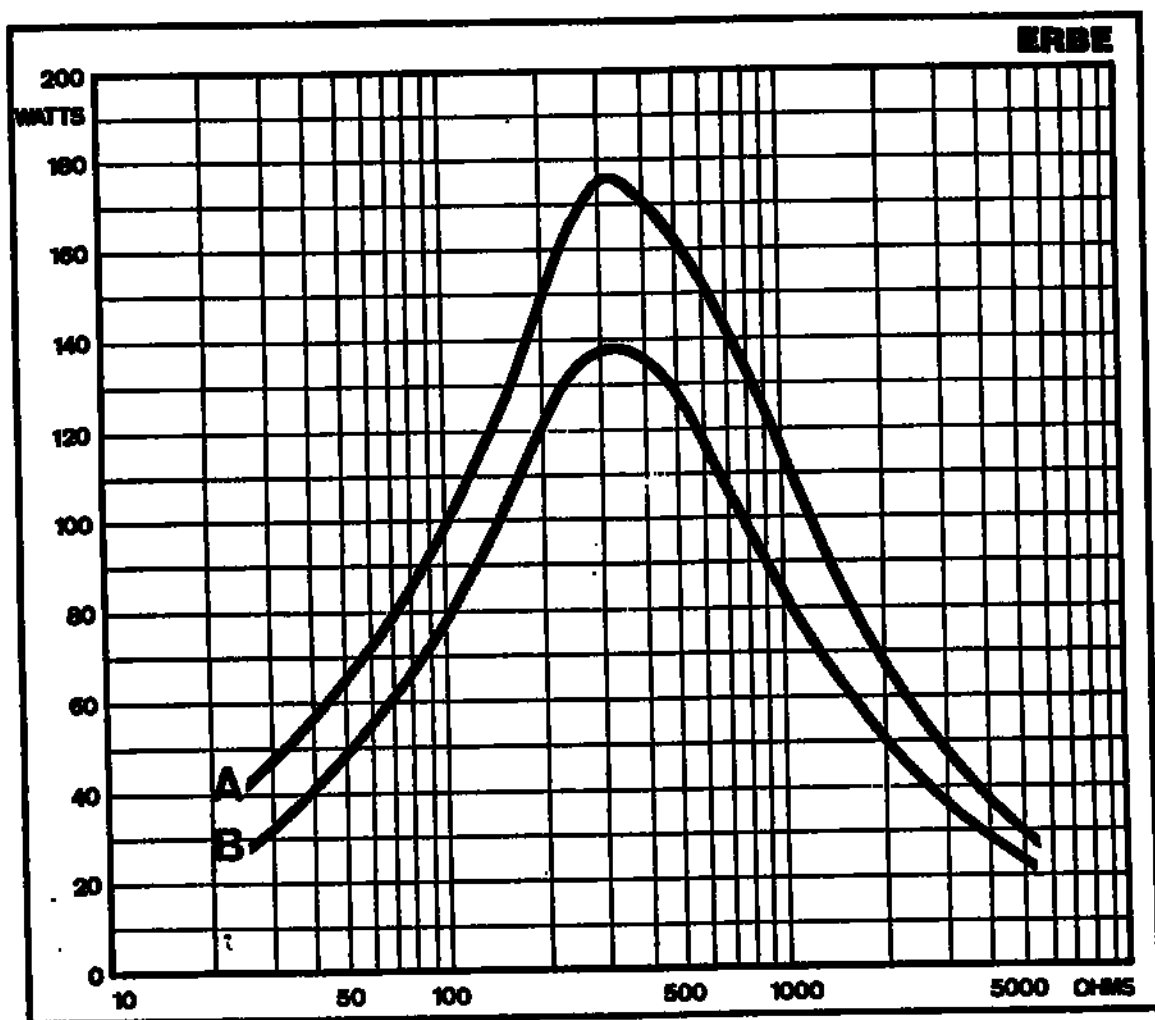
ERB0TOM T 175 E



Graph 2 : Output power of the bipolar generator as a function of the power setting.

Load resistance: 75 Ohms

ERBOTOM T 175 E



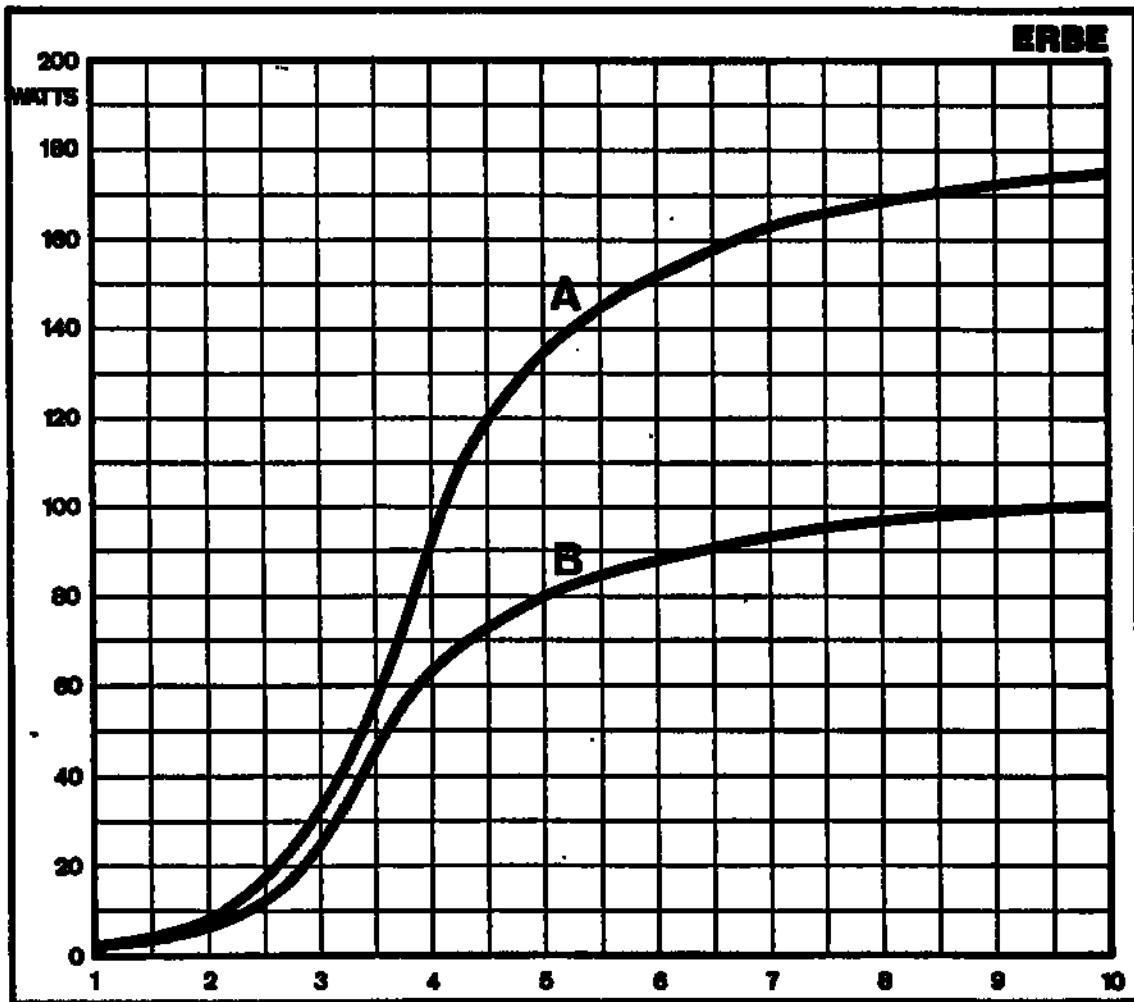
Graph 3 : Output power of the monopolar generator for pure cut as a function of load resistance.

Curve A : Output power at power setting 10

Curve B : Output power at power setting 5

Equipment impedance is 300 Ohms

ERBOTOM T 175 E



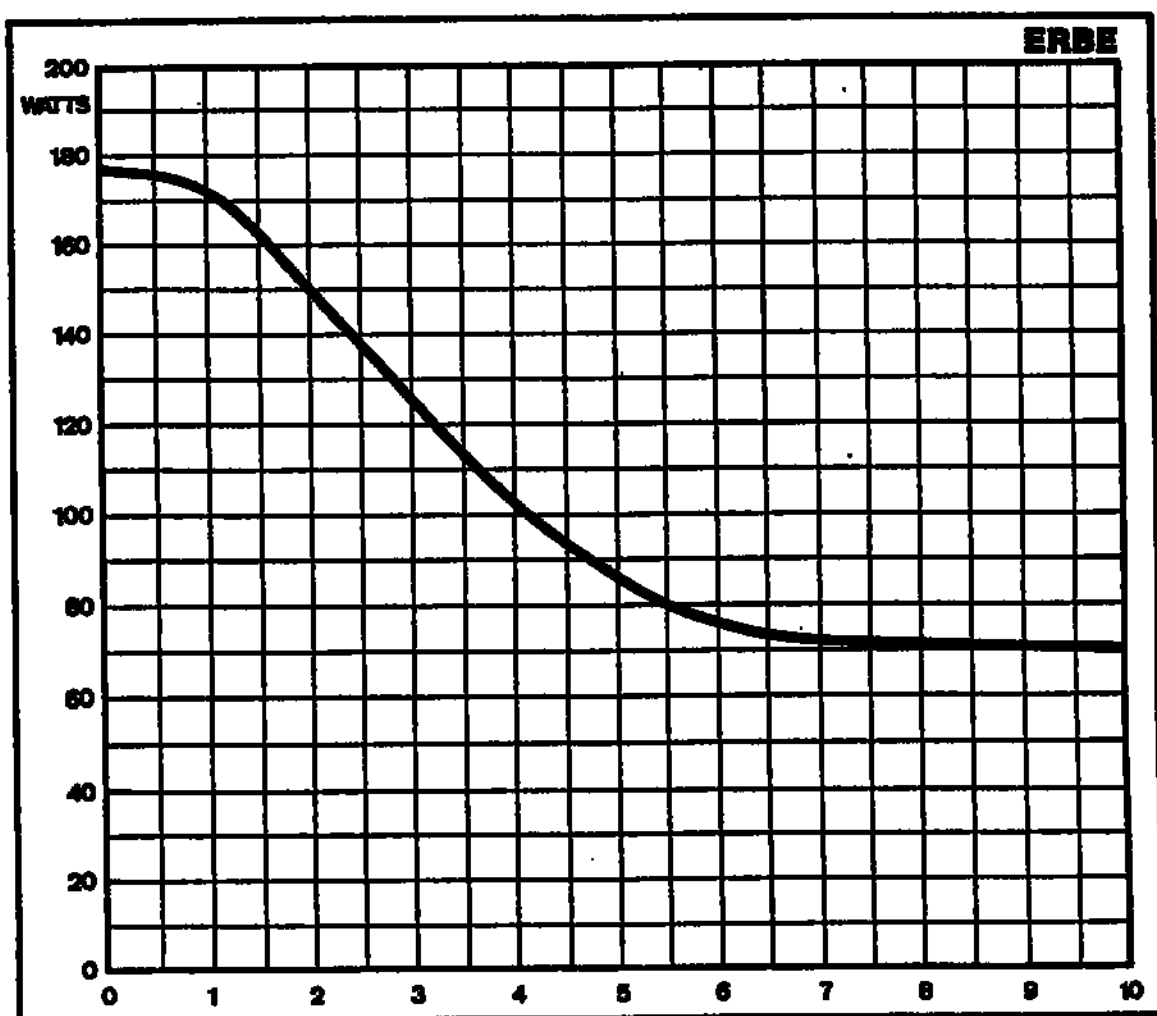
Graph 4 : Output power of the monopolar generator for cut and coagulation as a function of the power setting.

Curve A : cut

Curve B : coagulation

Equipment impedance is 300 ohms

ERBOTOM T 175 E



Graph 5 : Output power of the monopolar generator for cutting as a function of the haemostasis setting.

Load resistance: 300 ohms

Output power at power setting: 10

WARRANTY

Transportation Damage

The equipment and accessories should be examined on receipt for faults and transportation damage. Claims relating to transportation damage should be filed with the shipping agent without delay. A report of the damage must be prepared for the shipping agent.

Equipment Warranty

The period of warranty for the equipment is 1 year, starting from the day of delivery. Warranty claims only can be made if the certificate of warranty is properly filled out and mailed to the manufacturer of the equipment.

The scope of warranty includes free repair of the equipment, provided the damage was caused by either a defect in the material or by a fault caused during manufacturing.

Further claims, especially compensation claims, are excluded.

Repair only may be carried out by us, by one of our representatives or by an authorized service agent. The warranty is neither extended nor renewed by repair work under warranty.

MAINTENANCE, MODIFICATIONS, REPAIRS

In order to avoid accidents through errors resulting from ageing or wear of the unit or accessories, the unit including accessories should be tested regularly at suitable intervals and, when necessary repaired (see Publication 601-1 of IEC Standard).

Modifications and repairs to the unit and the accessories, with due regard for the special safety requirements of electromedical equipment, must only be carried out by ERBE or by service workshops, expressly authorized by ERBE to do so. The latter must provide a certificate on the nature and extent of the repair or modification, and where appropriate, any changes to ratings or working limitations. The certificate must also state the date, the name and address, and be duly signed.

If the repair and / or modification produces a change to ratings or working limitations including accessories, the unit inscriptions and accompanying documents must be altered accordingly (see Publication 601-1 of IEC Standard).

A certificate for repairs and alterations is shown in the appendix of these operating instructions.

The electrosurgical unit ERBOTOM T 175 E complies with the applicable IEC 601-1 and IEC 62 D requirements and is certified by the following institutions:

BSI	British Standard Institution, Safety Code for Electro-Medical Apparatus, Hospital Technical Memorandum 8.
CSA	Canadian Standards Association
NEMKO	Norges Elektriske Materielkontroll, Oslo
UTE	Union Technique de L'Electricité
SEV	Schweizerischer Elektrotechnischer Verein
ÖEV	Österreichischer Elektrotechnischer Verband

MODIFICATION/REPAIR CERTIFICATE

The following modifications and/or repairs have been carried out on the equipment:

As a result of the modifications, the following rated characteristics have been altered:

The modifications and/or repairs listed above have been carried out in accordance with technical requirements. The safety regulations, in particular the technical information provided by the manufacturer and the IEC regulations applicable at this time were known to me.

Name of service engineer:

Address of service engineer:

Date of repair/modification: