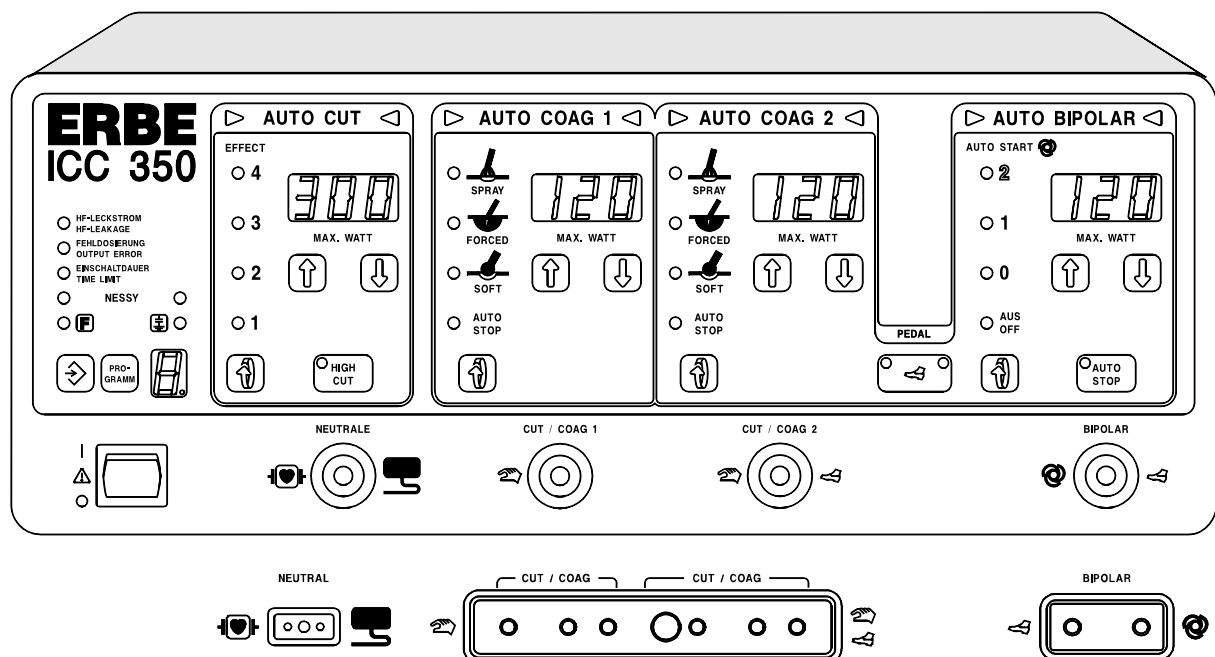


ERBE



ERBOTOM ICC 350

Instruction manual

08.00

ERBOTOM ICC 350 v 4.X

10128-016, 10128-061, 10128-300, 10128-301, 10128-025,10128-402

ERBOTOM ICC 350 Z v 2.X

10128-065

ERBOTOM ICC 350 T v 2.X

10128-066

ERBOTOM ICC 350 M v 4.X

10128-080, 10128-083

ERBOTOM ICC 350 M-DOKU v 4.X

10128-081

Instruction manual
08.00



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1 INTRODUCTION

1.1 Intended purpose of the ICC 350

The ICC 350 is a high-frequency surgical unit for cutting and coagulation. Due to its performance features, it has universal applications. To meet the special requirements of surgical specialty fields, the ICC 350 is available in several versions.

1.2 How do I work with this instruction manual?

Please read the instruction manual for the ICC 350. It applies to all versions of this high-frequency surgical unit. If you have an ICC 350 Z, for example, please additionally read the chapter ICC 350 Z.

1.3 Explanation of the safety instructions

The WARNING  safety instruction indicates a danger which can result in personal injury.

The CAUTION  safety instruction indicates a danger which can result in property damage.

The IMPORTANT safety instruction indicates a danger which can cause functional failure of the unit.

2 INITIAL OPERATION

Read carefully before initial operation of the unit.

In the development and production of this high-frequency surgical unit, the relevant, generally recognized rules of technology, as well as the valid occupational safety and accident prevention regulations have been taken into consideration. This ensures that patients, employees and third parties are protected from dangers to life and health during intended application of the high-frequency surgical unit, to the extent permitted by the type of application intended.

Initial operation

Before delivery, every high-frequency surgical unit is tested by the manufacturer in regard to its function and safety. To ensure that the unit also functions safely after shipping and installation at the operator's site, the following points should be observed:

The operator should only operate the high-frequency surgical unit if the manufacturer or supplier

1. has subjected the unit to a performance test on site
2. has instructed the parties responsible for operation of the unit in handling of the unit by means of the instruction manual.

3 RISKS AND SAFETY OF HIGH-FREQUENCY SURGERY

3.1 Unintentional thermal tissue damage

High-frequency surgery is associated in principle with various risks for the patient, the personnel and surroundings. In order to avoid these risks in practice, the surgeon and his/her assistants must recognize these risks and observe the appropriate rules for prevention of damage. In the following, these risks and rules for prevention of damage are explained.

3.1.1 Unintentional thermal tissue damage due to HF leakage currents

During high-frequency surgery, the patient unavoidably conducts high-frequency electrical current to ground potential. If the patient makes contact with electrically conductive objects during high-frequency surgery, a high-frequency electrical current can result at the contact point between the patient and this object, which can in turn cause thermal necroses. Not just objects made of metal are electrically conductive objects, but also wet cloths.

WARNING

The patient must be insulated against electrically conductive objects during high-frequency surgery. The black elastic table covers on operating tables demonstrate a certain electrical conductivity for diverting electrical charges. Therefore they are never suitable for ensuring the required insulation of the patient against metal parts of the operating table. For this reason, an electrically insulating intermediate layer, for example dry cover cloths, must be laid between the patient and this black operating table cover during the application of high-frequency surgery.

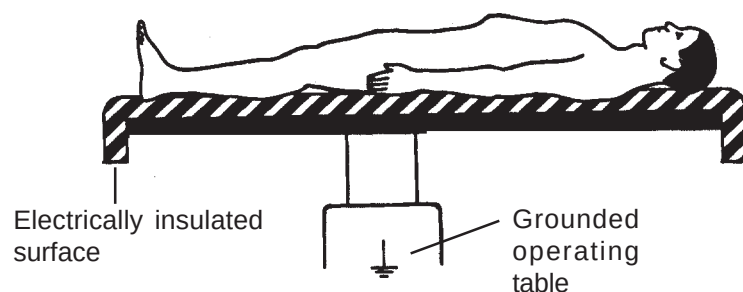


Fig.: Insulated positioning of the patient on the operating table

If it is possible for this intermediate layer to become wet during the operation, for example due to perspiration, irrigation liquid, urine etc., wetting of these intermediate layers must be prevented by a watertight sheet of plastic. Urine should be carried away via catheter.

- Extremities lying against the trunk or skin-to-skin contact points should be insulated from one another by laying dry cover cloths between them.
- Do not apply ECG electrodes closer than 15 cm next to the operating field.
- Needle electrodes or injection cannulae should not be used as ECG electrodes during high-frequency surgery.

3.1.2 Unintentional activation of an HF generator

Unintentional activation of an HF generator can lead to burns on the patient if the active electrode hereby touches the patient directly or indirectly through electrically conductive objects or wet cloths.

Unintentional activation of an HF generator can, for example, be caused by:

- Unintentionally pressing a footswitch pedal
- Unintentionally pressing a fingerswitch
- Defective fingerswitches, footswitches or cables
- Penetration of electrically conductive liquids (blood, amniotic fluid, urine, physiological saline solution, irrigation fluids etc.) into fingerswitches or footswitches.
- Errors within the high-frequency surgical unit

WARNING

To prevent burns on the patient due to unintentional activation of a high-frequency generator, the following application rules should be heeded:

- Never lay active electrodes onto or beside a patient in such a way that they can touch the patient directly or indirectly through electrically conductive objects or wet cloths.
- The lines to the active electrodes should be positioned in such a way that they touch neither the patient nor other lines.
- Always set the acoustic signal, which indicates the active status of the high-frequency generator, so that it can be easily heard.
- For operations in which the cutting or coagulation electrode unavoidably remains in contact with the patient even in a nonactive condition, e.g. for endoscopic operations, particular care is required. If such an electrode is unintentionally activated due to an error, this activated electrode should then not be removed from the body without special supervision. When removing the activated electrode from the patient's body, burns can result on all areas within the body which come into contact with the activated electrode. For this reason, in case such errors occur, the power switch for the high-frequency surgical unit should be switched off immediately before an attempt is made to remove the activated electrode from the body.

3.1.3 Unintentional thermal tissue damage due to inappropriate application

Generally speaking, the bipolar coagulation technique should be applied in preference to the monopolar coagulation technique. This particularly applies to coagulations on straight organs, on which the high-frequency current flows over longer areas through diameters which are approximately equal or become even smaller.

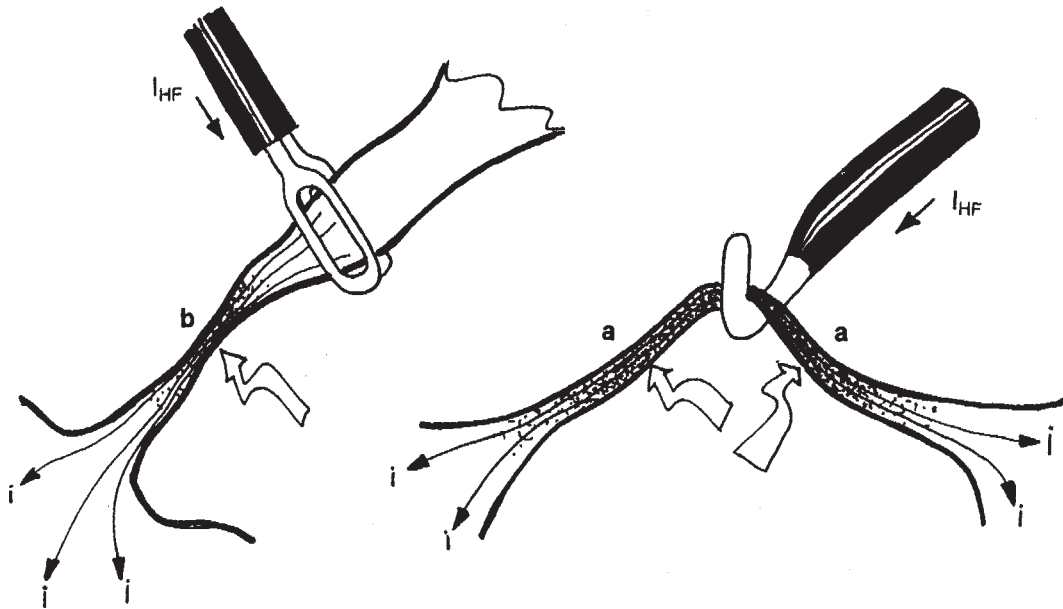


Fig.: Thermal damage of lateral tissue

The tissue is always first heated at places on the tissue where the diameter is smallest. If the HF current flows through the same diameter (a) over longer distances, the tissue coagulates over this entire distance. If the diameter of the tissue next to the application point of the coagulation electrode is smaller than at the point of application, coagulation will also occur next to the application point (b).

WARNING 

Always make certain that the HF current does not flow through thin tissue structures or vessels with a small diameter.

3.1.4 Unintentional thermal tissue damage due to inappropriate or nonapplication of the neutral electrode

With inappropriate or even nonapplication of the neutral electrode, there is a large risk of unintentional thermal tissue damage both at the application point of the neutral electrode as well as to other areas on the patient's body.

The neutral electrode must be applied with its entire surface as closely and reliably as possible to the operating field on the patient's body.

WARNING

The effective contact surface, i.e. the electrical conductive value between the neutral electrode and the patient must correspond to the HF capacity used, meaning the intensity of the HF current. Here the effective contact surface means the surface of the neutral electrode which has electrically conductive contact to the skin of the patient during high-frequency surgery.

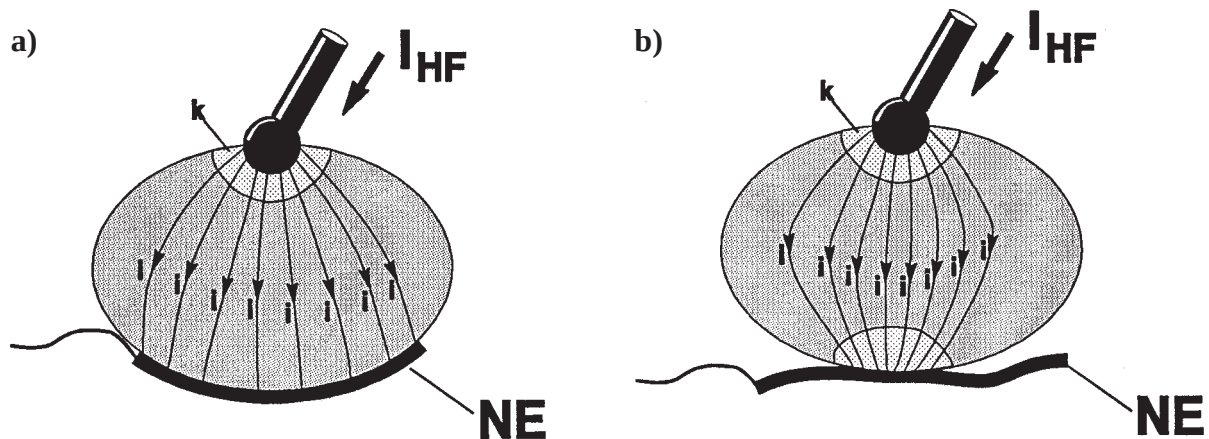


Fig.: The neutral electrode must be applied at an appropriate location on the patient's skin using the entire contact surface available (a). If the neutral electrode has only partial contact to the patient's skin (b), there is a risk that burning will occur at this location

3.1.5 Unintentional thermal tissue damage due to unsuitable and/or faulty accessories

It must be ensured that only accessories in perfect condition are used for high-frequency surgery. Only accessories that are compatible or tested by the unit manufacturer must be used. This applies both to the active electrodes including cable and plugs, as well as to the neutral electrodes including cables and plugs.

When using an instrument with electric insulation, it is necessary to be certain that these insulations are not overloaded and destroyed by overly high electric voltages. The electric output voltages for the high-frequency surgical unit are indicated for the various cutting and coagulation modes relative to the possible settings in this instruction manual. The electric strength of the instrument insulation can be found in the technical data for the instruments or, in case of doubt, can be requested from the manufacturer of the respective instrument.

WARNING

All insulation on electrodes, electrode holders, cables, plugs etc. must be in perfect condition.

3.1.6 Unintentional thermal tissue damage due to inattentiveness

Like a scalpel, high-frequency surgery is always a potential source of danger if handled without care.



The cutting or coagulation electrodes should always be handled with care and laid aside in the intervals between use so that neither the patient nor other persons can come in contact with the electrodes.

Laying unused electrode handles or coagulation forceps on the patient, next to the patient or within folds on the cover cloths is dangerous. Cases of burns on patients are known which were caused by laying the coagulation forceps within folds on the cover cloths which penetrated through the cloths into the patient's skin and resulted in burns without being noticed.

3.1.7 Unintentional thermal tissue damage due to output error

The risk of unintentional thermal tissue damage is proportionate to the intensity and time limit set on the unit for cutting or coagulation.



The intensity for cutting or coagulation should only be set and only activated for as long as necessary for the intended purpose.

An insufficient effect at a standard setting can, for example, be caused by poor attachment of the neutral electrode, poor contact in the connectors, defective cables or electrically insulating tissue remnants on the active electrode. This must be checked before setting at a higher power.

3.1.8 Unintentional thermal tissue damage due to the ignition of flammable liquids, gases and/or vapors

During high-frequency surgery, electric sparks or arcs that can ignite flammable liquids, gases or vapors occur at the active electrode.

WARNING

Make certain during high-frequency surgical operations that anesthetics, skin cleaning agents and disinfectants are nonflammable. If their use is unavoidable, they must have completely evaporated and the vapor must be removed from the area of spark formation before switching on the high-frequency surgical unit.



Before application of high-frequency surgery in the gastro-intestinal tract, it must be ensured that no flammable (endogenous) gases are present here. There is danger of explosion if flammable gases are present. For this reason, these gases must be extracted and/or eliminated by flushing out the affected lumen with CO₂ before using high-frequency surgery.

During transurethral resection (TUR), H₂O molecules may dissociate into H₂ and O₂ in the arc between the resection loop and the irrigation liquid. These gases may collect on the roof of the urinary bladder as a highly explosive gas mixture. If resection is performed in this gas mixture, dangerous explosions may occur.

3.1.9 Unintentional burns due to hot electrodes

Cutting and/or coagulation electrodes become hot during cutting and/or coagulation procedures indirectly through the heated tissue and through the electric arc.

WARNING

Tissue can be unintentionally burnt immediately after cutting and/or coagulation procedures if electrodes that are still hot touch the tissue. Attention must be especially paid to this during endoscopic operations, such as during pelviscopic fallopian tube coagulation or during endoscopic polypectomy.

3.2 Electric shock

An electric shock may occur if the high-frequency surgical unit delivers a too heavy low-frequency current or if a too heavy low-frequency current flows through the patient into the high-frequency surgical unit from another voltage source.

3.3 Stimulation of nerves and muscles

A known risk of high-frequency surgery is the unintentional electric stimulation of the patient's nerves and muscles. This stimulation can result from low-frequency electrical currents that are caused either by low-frequency current sources or due to electrical arcs between an active electrode and the patient's tissue.

Electric alternating current with a frequency above 300 kHz is unable to stimulate nerves and muscles.

During cutting procedures, forced coagulation and spray coagulation, the unavoidable electric arcs between an active electrode and the tissue nevertheless have the effect that a portion of the high-frequency alternating current is rectified, from which more or less strongly modulated, low-frequency current components result which stimulate electrically stimuable structures such as nerves and muscles.

This can result in more or less strong spasms or muscle contractions.

WARNING

When using high-frequency surgery on electrically stimuable structures, contractions of the affected muscles must be taken into account. This can occur, for example, during endoscopic operations in the urinary bladder in the vicinity of the obturator nerve and during operations in the area of the facial nerve.

3.4 Cardiac pacemaker

For patients with implanted cardiac pacemakers or pacemaker electrodes, irreparable damage to the pacemaker and disturbance of the pacemaker function, which can lead to ventricular fibrillation, must be reckoned with.

3.5 Danger of explosion

High-frequency surgical units always generate sparks during operation on the active electrode. For this reason, it is necessary to make certain during interventions that anesthetics, degreasers and disinfectants are neither flammable nor explosive. They should at least have evaporated completely before switching on the high-frequency surgical unit and be removed from the area of spark formation.

3.6 Interference with other electronic equipment

High-frequency surgical units normally generate high-frequency electrical voltages and currents which can interfere with other electronic equipment.

When installing or arranging sensitive electronic equipment in the operating room, this problem should be taken into consideration. In principle, sensitive electronic equipment should be set up as far as possible from the high-frequency surgical unit and particularly from the cables providing HF current. In addition, the cables providing HF current, which act like broadcast antennas, should not be unnecessarily long and should never be positioned parallel or too close to cables from sensitive electronic equipment.

The unit has been fitted with a special generator in consideration of the disturbance of sensitive electronic equipment, which generates a relatively low interference level as compared to conventional high-frequency surgical units.

4 DESCRIPTION OF THE HIGH-FREQUENCY SURGICAL UNIT

4.1 General description

Cutting with automatic control of the HF voltage (Auto Cut)

The ERBOTOM ICC is equipped with automatic open and closed loop control systems which control and regulate the parameters relevant to the cutting quality so that each respectively selected cutting quality is guaranteed to be reproducible and constant.

Adjustable power limitation in the cutting mode

Since the ICC units are equipped with automatic control of the HF voltage in the cutting mode, a power setting in regard to cutting quality is not required. The adjustable power limitation is primarily intended to guarantee the safety of the patient from unintentional thermal tissue damage, and to protect fine cutting instruments, such as fine needle electrodes, from destruction due to overly high HF currents if these come in contact in activated condition with other metallic instruments. The latter, for example, is a risk during laparoscopic operations. This adjustable power limitation must not be confused with the power setting for conventional high-frequency surgical units, where the cutting quality is directly dependent upon the power setting.

Monopolar and bipolar cutting modes

With the ERBOTOM ICC 350, both monopolar and bipolar cutting electrodes can be operated. A special operating mode is available for the users of bipolar cutting electrodes, which can be called up as program “b”.

Cutting with automatic control of the electric arc (HIGH CUT)

HIGH CUT is especially suitable for cutting in tissue with poor electric conduction. Since the HF voltage in the HIGH CUT mode can attain high values on the active electrode, HIGH CUT should however only be used with electrically well insulated instruments when cutting in tissue with poor electric conduction. For bipolar or quasibipolar cutting, HIGH CUT is not recommended inasmuch as the insulation paths for bipolar and quasibipolar instruments are generally very small and must not be exposed to higher voltages. For bipolar and quasibipolar instruments, automatic voltage control is recommended.

PPS (Power Peak System)

The initial incision phase can represent a special problem during an incision, particularly if the cutting electrode is firmly pressed against the tissue to be cut before activating the HF generator, so that the cutting electrode has a relatively large-surface, and therefore low-resistance, contact. This is the case, for example, for TUR and for endoscopic polypectomy. In such cases, the HF generator must provide higher-than-normal power so that the initial incision can proceed without delay, for otherwise a very large coagulation necrosis may result at the cutting location. The ICC is equipped with an automatic power control which recognizes low-resistance loads and controls the HF generator in such a way that it briefly provides enough power so that the HF voltage, i.e. the intensity of the electric arc, required for the set cutting quality is ensured even for a low-resistance load. Thanks to this device, the average power can be limited to relatively small quantities, which corresponds to an improvement in protection from unintentional thermal tissue damage.

ENDO CUT

A further special problem during endoscopic operations, for example during polypectomy and papillotomy, consists in the fact that the electrodes used for cutting, for example polypectomy loops and papillotomes, must be guided on long wire pulls through narrow working channels on flexible endoscopes, and therefore the operator has no direct control over the cutting procedure. However, particularly for polypectomy and papillotomy, a controlled incision is a requirement in preventing complications. An incision that is too fast can lead to bleeding of the cut edges due to lack of sufficient coagulation. An incision that is too slow can cause thermal damage, for example to the intestinal wall.

Soft coagulation

Soft coagulation can be activated by key or pedal. It is especially advantageous for use in combination with the Auto Stop mode available in the ICC. Here, the coagulation process is automatically stopped as soon as the electric resistance of the coagulum increases due to vapor formation. In this way, the coagulation process is prevented from stopping too early or too late. If the coagulation process stops too early, coagulation may be insufficient. If coagulation is too long, the coagulum can dry out and adhere to the coagulation electrode.

Forced coagulation

Forced coagulation is advantageous if an efficient hemostasis is to be achieved with relatively small-surface electrodes, such as TUR resection loops.

Spray coagulation

The Spray coagulation mode on the ICC is also suitable for Argon Gas coagulation.

Adjustable power limitation in the various coagulation modes

For the ERBOTOM ICC units, the surgically relevant coagulation qualities, i.e. the coagulation effects Soft Coag., Forced Coag. Spray Coag. and Bipolar Coag., are delimited by definition from one another and selectable by the press of a key. Nevertheless, the intensity of the different effects can be varied by power limitation.

The Soft, Forced and Spray modes are each doubly available

In this way, two different coagulation modes can be preset independent of one another and, if two coagulation instruments are used, applied independent of one another, although not simultaneously for reasons of safety. Thus for example one coagulation instrument can be connected and applied to Soft coagulation and another instrument to Argon Plasma coagulation on the same ICC 350.

Bipolar coagulation

In this coagulation mode, the HF voltage is, similar to Soft coagulation, automatically and constantly controlled, and its peak value always remains lower than 200 Vp, so that the current density and thus the coagulation effect is, for the most part, independent of the effective contact surface between the coagulation electrode and the tissue, provided the effective contact surface is not too large relative to the currently set power limitation.

The adjustable power limitation serves the purpose of protecting fine bipolar coagulation instruments, such as pointed bipolar coagulation forceps, from being thermally destroyed in case of a short between the two forcep tips.

The footswitch or Auto Start is used for activation.

In the Auto Start mode, the HF generator is automatically activated if both poles of the bipolar coagulation instruments used contact electrically conductive tissue simultaneously. Auto Start can occur either immediately at the moment of contact with the tissue or more or less temporally delayed. With immediate activation, it is possible to work very quickly, especially if several coagulations must be performed one after another. Delayed activation offers the operator the advantage that he/she can prepare and securely grasp the tissue to be coagulated with the bipolar coagulation forceps before the HF generator is automatically activated. Automatic activation of the HF generator only occurs if both poles of the bipolar coagulation instruments contact the tissue uninterrupted for at least as long as the respectively selected delay lasts. If the contact is interrupted before the respectively selected period of delay is over, the respective period of delay restarts as of the next contact.

Deactivation can proceed either via the pedal (however only if it was also activated via the pedal), or via Auto Stop. In the Auto Stop mode, the HF generator is automatically deactivated as soon as the electric resistance of the coagulum increases due to vapor formation. In this way, the coagulation process is stopped for the coagulum dries out or even carbonizes. This prevents the coagulum from adhering to the coagulation electrode and that the coagulation electrode becomes soiled too quickly.

Programmability of the front panel

In spite of the multiple possibilities for use of the ICC 350, this unit is relatively simple and easy to operate. This especially applies to the utilization of the memory available in this unit, in which various front panel settings can be stored.

4.2 Description of the controls



This symbol, in accordance with EN 60 601-1, is intended to indicate to the user that this unit must only be used on the patient if the user is acquainted with the operation and features of this unit.

The figures set in cursive relate to the ICC illustration for this chapter, or to the function fields in the text.

1 Power switch

Using this power switch, the unit is switched on and off.

Each time after being switched on, the unit automatically proceeds with various performance checks. If an error in the unit or in the accessories is recognized here, a warning signal sounds and the determined error is indicated by a corresponding error number. (See Chapter 12.1, Automatic performance checks after switching on the unit). If no error is determined, the unit is ready to operate.

If the unit was switched off for less than approx. 15 seconds, all settings for the program used before switching off appear after the automatic performance check on the front panel, and the unit can be immediately reactivated. This is advantageous if, for example, the power supply briefly fails.

If the unit was switched off for longer than approx. 15 seconds, the basic setting of the program used before switching off appears after the automatic performance check on the front panel, whereby all relevant visual displays continue to blink and the unit cannot be activated until any key on the front panel is briefly pressed as confirmation that this program should be used. Then the relevant displays are continuously illuminated and the unit can be activated using the available settings. These settings can be changed or adapted to the current requirements at any time. However, other programs can be selected as well.

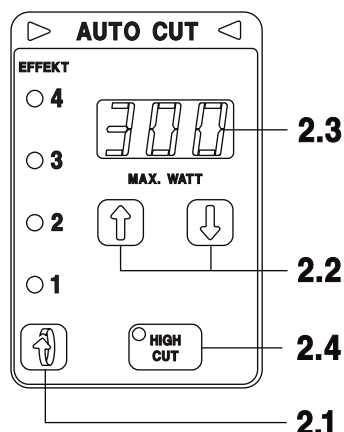
2-5 Function fields

The AUTO CUT, AUTO COAG 1, AUTO COAG 2 and AUTO BIPOLAR function fields can be adjusted separately from one another, although not activated simultaneously for reasons of safety.



Function fields that are not used may be switched off completely to prevent unintentional activation. To do this the power limitation must be turned down so far in the corresponding function field until a beep is heard and “—” appears on the digital display. The corresponding function field cannot be activated in this condition.

2 AUTO CUT function field



All parameters can be set in this function field that are relevant to cutting:

2.1 Setting of the coagulation EFFECT when cutting

Here the required cutting quality in regard to the coagulation effect on the cutting edges can be adjusted.

Level 1 corresponds to minimum coagulation effect.

Level 4 corresponds to maximum coagulation effect.

2.2 Setting the power limitation

The HF power output can be limited in one watt steps from 300 watts to 1 watt. If display 2.3 shows “—”, the Auto Cut mode is switched off.

2.3 Display of the set power limitation in watts

This display shows the respectively set power limitation

2.4 HIGH CUT ON/OFF

The required Cut mode “AUTO CUT“ or “HIGH CUT“ can be set here. In “AUTO CUT“ mode, the HF voltage is constant. In the “HIGH CUT“ mode, the intensity of the arc between the active electrode and the tissue is constant.

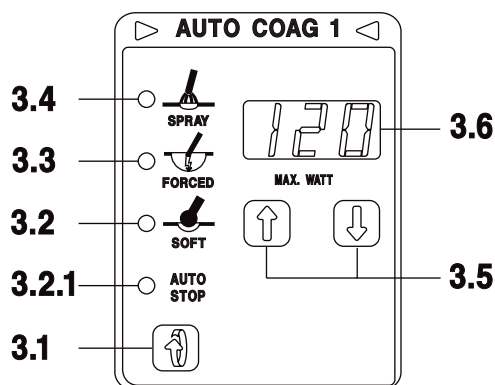
Activation of monopolar cutting

can be done using either the yellow key on the electrode handle or the yellow pedal on the footswitch. Activation is visually signaled by continuous illumination of the triangle symbols in the upper part of the CUT function field and also acoustically signaled. Monopolar cutting instruments are connected to the CUT/COAG 1 and/or CUT/COAG 2 sockets.

Activation of bipolar cutting

proceeds via the yellow pedal. To do this, program “b“ = bipolar must be selected. Activation is visually signaled by continuous illumination of the triangle symbol in the upper part of the Auto Cut function field as well as acoustically signaled. Bipolar instruments are connected to the BIPOLAR socket. The maximum power setting for bipolar cutting is 100 watts. In program “b“, the AUTO BIPOLAR function field for bipolar coagulations can also be activated via the blue pedal of a dual-pedal footswitch or by the white pedal on a single-pedal footswitch. For bipolar cutting, the High Cut cutting mode is not required and therefore cannot be activated.

3 AUTO COAG 1 function field



All parameters can be set in this function field and are relevant to monopolar coagulation:

3.1 Selection of the coagulation mode

By pressing this key, one of the following coagulation modes can be selected:

3.2 Soft coagulation without Auto Stop

3.3 Forced coagulation (Check the version. See Chapter 10.12)

3.4 Spray coagulation (Also suitable for Argon Plasma coagulation)

3.5 Power limitation

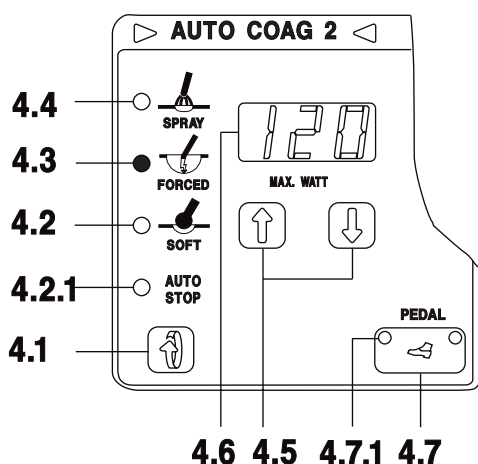
The HF power output can be limited in 1 watt steps from 120 watts to 1 watt. If the display 3.6 shows “—”, the Auto Coag 1 mode is switched off.

3.6 Display of the set power limitation in max. watt

Activation

The coagulation modes for this AUTO COAG 1 function field can be started via the blue key on an electrode handle, and stopped via this key or automatically (Auto Stop). Activation is visually signaled by continuous illumination of the triangle symbols in the upper part of the AUTO COAG 1 function field as well as acoustically signaled.

4 AUTO COAG 2 function field



All parameters can be set in this function field and are relevant to monopolar coagulation:

4.1 Selection of the coagulation mode

By pressing this key, one of the following coagulation modes can be selected:

4.2 Soft coagulation without Auto Stop

4.2.1 Soft coagulation with Auto Stop

4.3 Forced coagulation (Check the version. See Chapter 10.12)

4.4 Spray coagulation (Also suitable for Argon Gas coagulation)

4.5 Power limitation

The HF power output can be limited in 1 watt steps from 120 watts to 1 watt. If the display 4.6 shows “—”, the Auto Coag 2 mode is switched off.

4.6 Display of the set power limitation in max. watt

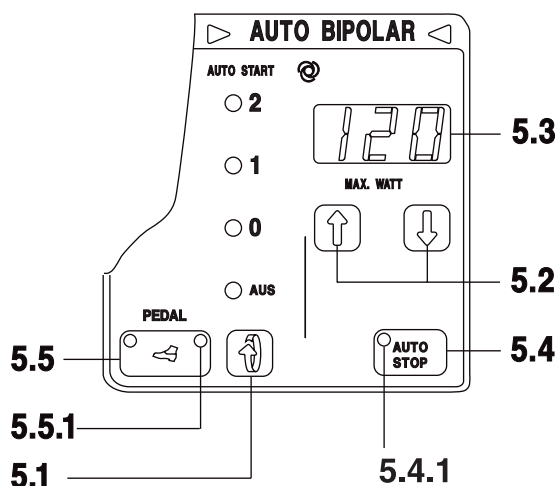
4.7 Changeover switch for the blue pedal

If the left signal 4.7.1 is illuminated in this key, the currently selected coagulation mode of the Auto Coag 2 function field can be activated via the blue pedal of a dual-pedal footswitch.

Activation

The coagulation modes for this AUTO COAG 2 function field can be activated via the blue key on an electrode handle or via the blue pedal of a footswitch and stopped via this key or this pedal or automatically (Auto Stop). Activation is visually signaled by continuous illumination of the triangle symbols in the upper part of the COAGULATION function field as well as acoustically signaled.

5 AUTO BIPOLAR function field



All parameters can be set in this function field and are relevant to bipolar coagulation:

5.1 Selection of the Auto Start mode

If the unit is to be activated by Auto Start, three different Start modes are available:

AUTO START 2	Auto Start with a long start delay
AUTO START 1	Auto Start with a short start delay
AUTO START 0	Auto Start without a start delay
AUTO START OFF	No Auto Start

The operator can use the start delay, for example, to prepare or safely grasp the tissue to be coagulated with the coagulation forceps before starting.

WARNING

Only use Auto Start if unintentional contact of tissue with the coagulation instrument can be safely avoided. For endoscopic interventions, such as laparoscopy, pelviscopy or thoracoscopy, Auto Start should not be used because unintentional contact of the coagulation instrument with tissue cannot be safely avoided here.

The AUTO START key has no function on the ICC 350 No. 10128-025!

In some countries the ICC units are supplied with the AUTO START function deactivated. This may also apply in your case. If you nevertheless wish to use the AUTO START function, please consult your local ERBE branch office. You will find the address on the last page of the Instruction Manual. Technical Service will activate the AUTO START function for you on request.

5.2 Power limitation

With the Auto Start switched off, the HF power output can be limited in 1 watt steps from 120 watts to 1 watt. With Auto Start, the HF power output is limited to 50 W max. If the display 5.3 shows “—”, the Auto Bipolar mode is switched off. The power limit is recommended, for example, for pointed bipolar coagulation forceps, because in this way thermal damage to the forceps points can be prevented if these directly contact each other.

5.3 Display of the set power limitation in max. watt

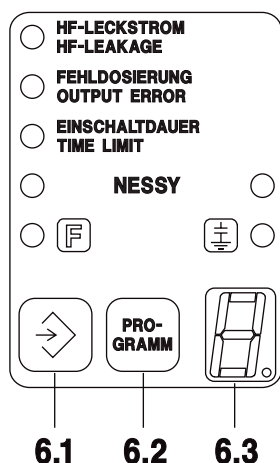
5.4 Auto Stop mode

In the Auto Stop mode, the HF generator is automatically switched off as soon as the water reaches the vapor phase in the coagulum. The Auto Stop mode is switched once signal lamp 5.4.1 is illuminated.

5.5 Activation, changeover switch for the blue pedal of a dual-pedal footswitch

If the right signal 5.5.1 is illuminated in this key, the Auto Bipolar can be started via the blue pedal on a dual-pedal footswitch. Auto Bipolar can also be activated via the white pedal on a single-pedal footswitch or by Auto Start.

6 Working with programs



The ERBOTOM ICC 350 is equipped with 11 memory locations for storage of various basic settings. In this way, the settings required for every application of high-frequency surgery can be reduced to a minimum.

A basic setting is the setting which is defined at the factory or by the user and is stored in the program memory. Consequently, every program has a basic setting.

The basic setting for program “0” is defined and programmed by the manufacturer and cannot be reprogrammed by the user. For the ERBOTOM ICC 350, Software Version 1.05 and up, the basic setting for program “0” is defined and stored as follows:

- AUTO CUT:** Auto. voltage control, Effect 3, power limitation 150 watts
Activation with yellow key or yellow pedal
- AUTO COAG 1:** Soft coagulation, power limitation 60 watts
Activation with blue key
- AUTO COAG 2:** Forced coagulation, power limitation 60 watts
Activation with blue key or blue pedal
- AUTO BIPOLAR:** Power limitation 40 watts
Activation with white pedal, Auto Stop off

The basic settings for programs “1” to “9”, as well as Program “b” = Bipolar for bipolar cutting and coagulation, can be custom-defined and programmed by the user. It is recommended that the corresponding basic settings be documented.

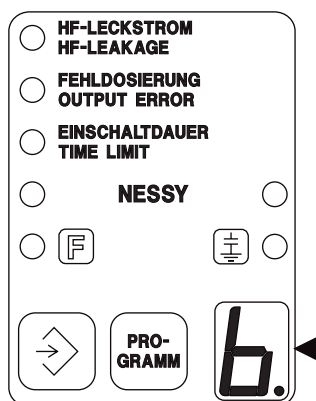
The use of programs is especially practical for special application areas or custom settings. The basic setting of each selected program is also immediately available again if the unit has been switched off in the meantime. If another program is required than that appearing in display 6.3 after the unit is switched on, the required program can be called up by pressing key 6.2 “PROGRAMM”. The unit is immediately ready to operate using this program. If necessary, the functions and parameters appearing on the front panel for the appropriately selected program through the basic setting, can be changed or adapted to the immediate purpose and, if the changed

setting is also to be used for the following operations, it can be accepted into this program. To do this, only the SAVE key 6.1 must be depressed uninterruptedly long enough until “Set“ is indicated on display 3.6 for Auto Coag 1 and the signal heard continuously during storage changes into an intermittent signal.

WARNING

The operator and/or user of the unit must ensure that programs are not changed and stored uncontrollably. Program changes must always be documented and all users must be informed.

Program b = Bipolar



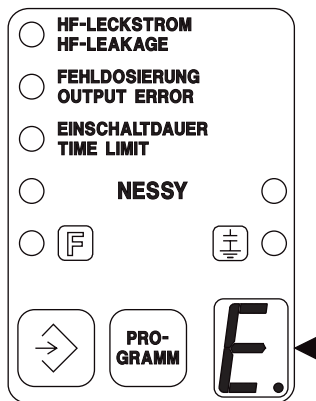
With Program “b“, bipolar instruments connected to the bipolar output of the unit can be used for coagulation and cutting.

The parameters for bipolar cutting with a choice of coagulation effect are set via the AUTO CUT function field. The parameters for bipolar coagulation are set via the AUTO BIPOLAR function field.

Settings

- | | |
|---------------------|---|
| AUTO CUT | The HF power output for bipolar cutting can be limited in 1 watt steps from 100 watts to 1 watt .
EFFECT can be set from 1 to 4. |
| AUTO COAG 1 | This function field is not limited and all parameters can be set. |
| AUTO COAG 2 | This function field is switched off. |
| AUTO BIPOLAR | The HF power output for bipolar coagulation can be limited in 1 watt steps from 120 watts to 1 watt .
With the changeover switch for the blue pedal of a dual-pedal footswitch, activation can be blocked using the blue footswitch pedal.
Activation of AUTO STOP is possible.
AUTO START is blocked in this program. |

Program E=ENDO CUT



ENDO CUT is a cutting mode in which the incision is automatically controlled in such a way that alternating short, automatically controlled cutting intervals result with defined pause intervals. In this way a polypectomy loop, for example, cannot cut through a polyp at just any speed, but rather at a controlled speed.

A further special problem during endoscopic operations, for example during polypectomy and papillotomy, consists in the fact that the electrodes used for cutting, for example polypectomy loops and papillotomes, must be guided on long wire pulls through narrow working channels on flexible endoscopes, and therefore the operator has no direct control over the cutting procedure. However, particularly for polypectomy and papillotomy, a controlled incision is a requirement in preventing complications. An incision that is too fast can lead to bleeding of the cut edges due to lack of sufficient coagulation. An incision that is too slow can cause thermal damage, for example to the intestinal wall.

The initial incision phase can represent a special problem during an incision, particularly if the cutting electrode is firmly pressed against the tissue to be cut before activating the HF generator, so that the cutting electrode has a relatively large-surface, and therefore low-resistance, contact. This is the case, for example, for endoscopic polypectomy of larger polyps as well as for papillotomy. In such cases, the HF generator must provide higher-than-normal power so that the initial incision can proceed without delay, for otherwise a very large coagulation necrosis may result at the cutting location. The ERBOTOM ICC 350 is also equipped in the ENDO CUT mode with an automatic initial incision control which recognizes low-resistance loads and controls the HF generator in such a way that it briefly provides enough power so that the initial incision can proceed without delay. As soon as the initial incision has been made, the HF voltage for the intensity of the electric arc required for the respectively selected cutting quality is automatically controlled and the cutting procedure is automatically fractionated as described above. Thanks to this device, the entire cutting procedure from the start to the finish of the incision is automatically controlled. Additionally, this considerably reduces the average power during an incision as compared to unregulated, nonautomatically controlled high-frequency surgery units.

Settings

AUTO CUT	The HF power output for ENDO CUT can be limited in 1 watt steps from 200 watts to 1 watt . The LED for HIGH CUT is illuminated. EFFECT can be set from 1 to 4.
AUTO COAG 1	This function field is not limited and all parameters can be set.
AUTO COAG 2	This function field is not limited and all parameters can be set.
AUTO BIPOLAR	This function field is not limited and all parameters can be set.

7 Connecting socket for neutral electrodes

For monopolar cutting and/or coagulation, a suitable neutral electrode must be used that must both be connected to the unit as well as carefully applied to the patient.

The ERBOTOM ICC 350 is equipped with a Neutral Electrode Safety System (NESSY) which automatically monitors the electrical connection between the neutral electrode and the unit as well as application of the neutral electrode on the patient. The latter only then however if neutral electrodes with two contact surfaces are used (See Chapter 4.3.5 NESSY).

WARNING

If single-surface neutral electrodes are used, the NESSY only monitors the electrical connection between the neutral electrode and the unit, but not the application of the neutral electrode on the patient.

The pictograms beside the connecting socket for neutral electrodes have the following explanation:



Neutral electrode in general

The ERBOTOM ICC 350 conforms to the requirements of Type CF in accordance with EN 60 601-1. In addition, this pictogram indicates in accordance with EN 60 601-2-2 that the neutral electrode can remain applied to the patient during defibrillation.

The capacitive grounding of the neutral electrode and the type CF appear to contradict one another. The ICC 350 fulfills both specifications at the same time because it is equipped with a low-frequency leakage current monitor, which automatically monitors low-frequency leakage currents that flow into or out of the unit.

8 Connecting socket for the AUTO CUT and AUTO COAG 1 function fields

Electrode handles with fingerswitches can be operated from this connecting socket. This connecting socket can only be activated via the fingerswitch.

Information regarding the connection and the activation possibilities of instruments for Argon Plasma surgery (APC) can be found in the instruction manuals for APC units.

9 Connecting socket for the AUTO CUT and AUTO COAG 2 function fields

Electrode handles or other monopolar coagulation instruments with or without fingerswitches can be operated from this connecting socket. Also other monopolar instruments with or without switches, such as rigid or flexible endoscopes for endoscopic operations, can be connected to this connecting socket. Make certain here that the plug type is suitable. This connecting socket can either be activated via the fingerswitch or pedals of a footswitch.

Information regarding the connection and the activation possibilities of instruments for Argon Plasma surgery (APC) can be found in the instruction manuals for APC units.

WARNING

For simultaneous connection of two electrode handles to both monopolar connecting sockets 8 and 9, electrode handles (particularly if they look alike) must be laid down in such a way that there can be no mix-up. In case of doubt, a trial activation of the unit should be performed without contacting the patient with the active electrode.

10 Connecting socket for the AUTO BIPOLAR function field

Bipolar instruments for coagulation or cutting can be connected to this connecting socket.

The coagulation mode can be activated via pedal or Auto Start. In the coagulation mode, the Auto Stop function is also available.

The bipolar cutting mode is available in Program “b” and can be activated via the yellow pedal.

CAUTION

When using pointed bipolar coagulation forceps, the tips can be thermally damaged due to electric currents that are too high. To prevent this, it is recommended that the power limitation be set as low as possible and/or make certain that the tips of the bipolar coagulation forceps do not touch one another..

11 Safety field

High-frequency surgical units of the ERBOTOM ICC series are equipped with various safety devices to protect the patients and users.

12 Connecting socket for a dual-pedal footswitch

A dual-pedal footswitch can be connected to this connecting socket. When using a dual-pedal footswitch, only the AUTO function field can be activated with the yellow pedal. Using the blue pedal, either the AUTO COAG 2 or AUTO BIPOLAR function field can be activated. The blue pedal is assigned to the AUTO COAG 2 or AUTO BIPOLAR function field via the key PEDAL between the AUTO COAG 2 and AUTO BIPOLAR function fields.

13 Connecting socket for a single-pedal footswitch

A single-pedal footswitch can be connected to this connecting socket, by which the AUTO BIPOLAR function field can be activated. When using the ICC 350 in combination with an Argon Plasma coagulation unit model APC 300, the APC 300 is joined to this connecting socket on the ICC 350 via a special cable (detailed information on this can be found in the APC 300 instruction manual).

WARNING

If both a dual-pedal footswitch and a single-pedal footswitch are connected to the unit, the AUTO CUT, AUTO COAG 2 and AUTO BIPOLAR function fields can, for example, be activated via the corresponding pedals without further changeovers on the unit.

14 Terminal for potential equalization

For this, see Chapter 10.4, INSTALLATION.

15 Volume of the acoustic signal

The volume of the acoustic signals can be adjusted with this knob.

This does not apply to warning signals, which must always be sufficiently loud.

WARNING

An important purpose of this acoustic signal is to protect the patients and personnel from burns due to unintentional activation of the high-frequency generator (for more information, see Chapter 3.1.2, Unintentional activation of a high-frequency generator).

16 Loudspeaker for acoustic signals

Always set up the instrument in such a way that acoustic signals are easily heard from this speaker. The volume of the acoustic signals is set at the factory.

17 Power connection

This high-frequency surgical unit must only be connected via the power cord supplied by the unit manufacturer or one of these of equal quality, which bears the national test symbol, to correctly installed hospital grade power sockets. Here, for reasons of safety, no multiple sockets or extension cords must be used if possible. If their use is unavoidable, they must be equipped with a correctly functioning grounded connector.

18 Power fuses

The unit is secured with two fuses. If these fuses fail, an authorized technician should inspect the unit for possible errors before putting back into operation.

4.3. Description of the safety features

The ICC 350 is equipped with the following safety features:

4.3.1 LF LEAKAGE = Automatic monitoring of low-frequency leakage currents

4.3.2 HF LEAKAGE = Automatic monitoring of high-frequency leakage currents

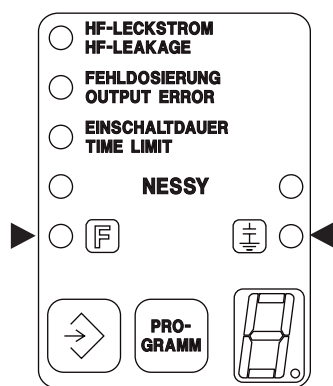
4.3.3 OUTPUT ERROR = Automatic monitoring of unit-related output error

4.3.4 TIME LIMIT = Automatic monitoring of the time limit

4.3.5 NESSY = Neutral Electrode Safety System

4.3.6 Protection against operating error

4.3.1 Low-frequency leakage current monitor

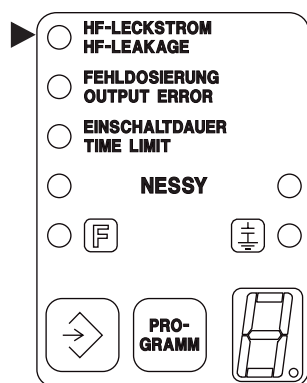


The ERBOTOM ICC 350 can optionally be operated in Floating Output (F) or in Earth Referenced (⏏) Output mode. These modes can be changed over by a technician authorized to do this (see Chapter 10.13). In the Floating Output mode, the low-frequency leakage current generally represents no problem, because the applied part here is extensively insulated to ground potential. In the Earth Referenced Output mode, the neutral electrode within the unit is capacitively related to ground potential. A low-frequency leakage current higher than 0.05 mA can flow through this capacity if need be. For this reason, the ERBOTOM ICC 350 is equipped with an LF leakage monitor which automatically monitors the LF

leakage current flowing through the patient via the applied part of the high-frequency surgical unit. If the LF leakage current rises above 0.05 mA, the LF leakage monitor automatically separates the capacitive ground for the neutral electrode within the unit immediately, which decreases the LF leakage current to less than 0.05 mA. This error is indicated visually as Error no. 5 and acoustically. The HF generator can only be activated once the cause of error has been eliminated.

In this way, the ERBOTOM ICC 350 also fulfills the Type CF requirements in the Earth Referenced mode.

4.3.2 High-frequency leakage monitor



HF leakage currents are unavoidable during high-frequency surgery. This especially applies to all monopolar application techniques.

To prevent HF leakage currents flowing uncontrolled through the patient and causing unintentional burns, patients should have no contact with electrically conductive objects during high-frequency surgery. This especially applies to objects that are conductive or capacitively grounded. If this requirement is fulfilled, burns on patients due to HF leakage are avoidable.

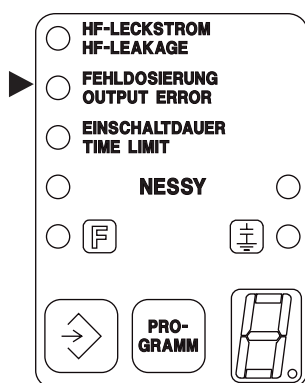
In EN 60 601-2-2, Sec. 19.101, the maximum permissible HF leakage current which cannot cause noticeable burns on patients is given as 150 mA.

In practice, despite careful positioning of the patient on the operating table, unintentional contact of the patient with electrically conductive objects can occur. In some operations, such contacts are unavoidable.

The ICC is therefore equipped with an HF leakage monitor, which automatically monitors the HF leakage current and generates a visible warning signal if the HF leakage exceeds $150 \text{ mA}_{\text{eff}}$.

If the HF leakage current exceeds $300 \text{ mA}_{\text{eff}}$, the HF leakage monitor additionally produces an acoustic signal. If the acoustic signal is heard, the operator should then only continue to use high-frequency surgery if, for example, an incision or a hemostasis has absolute priority.

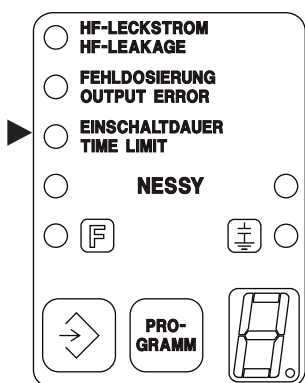
4.3.3 Unit-related output error



The ICC is equipped with automatic monitoring of the HF output parameters, which monitors deviations in the actual value from the set value for the currently set HF output parameters and produces a warning signal and/or switches off the HF generator if the deviation is so large that the required quality of the respective effect (cutting or coagulation) is no longer ensured. In case of deviations or absence of the required effect, display of a unit-related output error allows the operator to immediately check whether the defect is caused by the unit or not.

Deviations in the HF output parameters from the currently set HF output parameters on the ICC can only result from loads which have too low a resistance, e.g. coagulation electrodes that are too large, a short circuit between the active and neutral electrode, or due to an error in the unit.

4.3.4 Time limit



With normal use, a high-frequency generator is only activated briefly for performance of an incision or a coagulation by fingerswitch, pedal or AUTO START. This generally lasts only a few seconds.

Through an error in the unit, in the accessories or in use, the high-frequency generator can be switched on unintentionally. To prevent greater damage due to unintentional activation of the high-frequency generator, the ICC is equipped with a monitor which automatically monitors the time limit on the high-frequency generator. Once a predetermined maximum time limit has been exceeded, this monitor generates a visible signal. If the high-frequency generator is then

not switched off, the generator additionally produces an acoustic signal and automatically switches the HF generator off. The high-frequency generator can however be restarted at any time, whereby the time limit is also monitored anew. In this way, greater damage due to unintentional activation of a high-frequency generator for undeterminably long times is avoided.

Custom adaptation of the maximum time limit

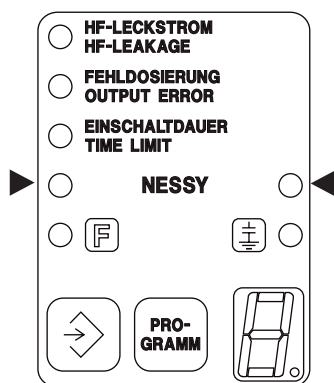
In consideration of the risk of thermal tissue damage due to unintentional switching on of an HF generator, an unintentionally switched-on HF generator should be switched off again as soon as possible automatically. Since the unit cannot automatically distinguish between intentional and unintentional switching on of an HF generator, the automatic switching off of an HF generator must not occur too quickly, because this would hinder the operator during cutting and/or coagulation. Since the risk of thermal tissue damage varies greatly among the various operating modes, the ICC can adapt and store the maximum time limit for each operating mode and in each storable program via the Test program no. 10 of at least 3 sec. to a maximum of 900 sec.

WARNING

For reasons of safety, a change in the automatic limitation of the maximum time limit must only be made if all users of this unit are informed properly and in good time about this change.

In addition, a change in the automatic limitation of the maximum time limit must be properly documented, for example in the medical product logbook of the respective unit.

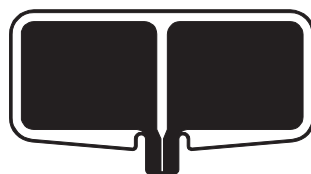
4.3.5 NESSY



The units in the ERBOTOM ICC model series are equipped with a Neutral Electrode Safety System (NESSY), which monitors both the electric connection between the unit and neutral electrode as well as the correct application of the neutral electrode on the patient.



When using neutral electrodes with only one contact surface, only the electric connection between the unit and neutral electrode is automatically monitored. If this connection is sound, the green NESSY signal (LED) is illuminated and all operating modes can be activated. If this connection is interrupted, the green NESSY signal (LED) is not illuminated and the monopolar operating modes cannot be activated. If an attempt is made in this condition to activate a monopolar operating mode, the red NESSY signal (LED) is illuminated and a warning signal is heard at the same time.



When using neutral electrodes with two contact surfaces, not only the electric connection between the unit and neutral electrode is automatically monitored, but also the application of the neutral electrode on the patient. Here the electric conductance between the two contact surfaces on the neutral electrode and the skin of the patient is constantly measured automatically and compared with the intensity of the high-frequency current that flows through the neutral electrode.

If the intensity of the high-frequency current is greater than is permissible at the respectively measured conductance, NESSY then produces visual and acoustic warning signals and the operator should only continue to use the high-frequency surgery if an incision or hemostasis has absolute priority. If the measured conductance between the neutral electrode and the patient is too small, monopolar operating modes cannot be activated.

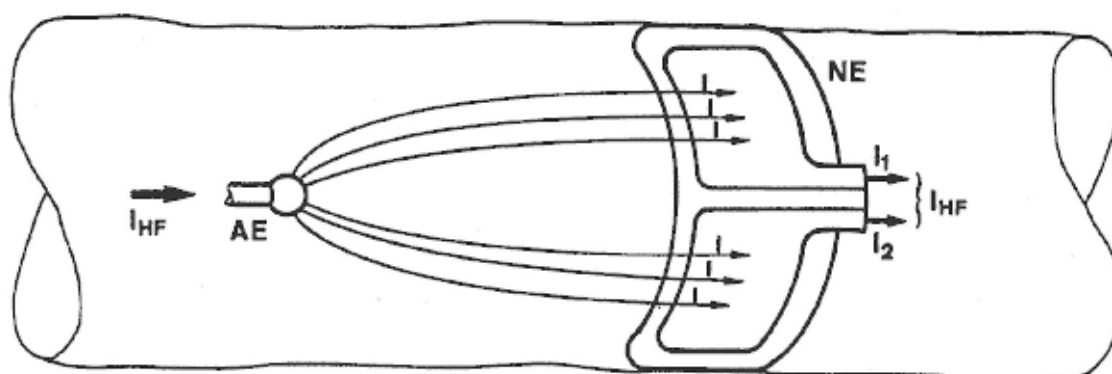
The diversity of neutral electrodes models for high-frequency surgery is very large. The ideal neutral electrode, optimal for all applications, does not yet exist. To ensure the user a large degree of freedom in the selection of the best suited neutral electrodes for his/her purposes, NESSY is a flexible Neutral Electrode Safety System that can be adapted optimally to the neutral electrodes selected by the user. For appropriate advice and adaptation to suit requirements, please contact your local Erbe office (see Chapter Addresses).

WARNING

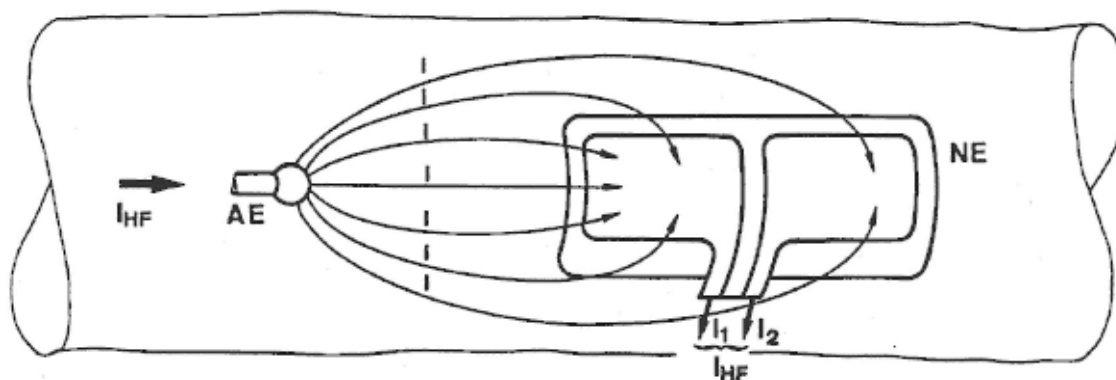
For reasons of safety, a change to NESSY may only be made if it has been properly ensured that all users of this unit are informed in good time about this change. In addition, a change to NESSY must be properly documented.

When using dual-surface neutral electrodes, NESSY also monitors the application direction of the contact surface relative to the direction of current flow. Since the high-frequency current is generally not distributed evenly over the contact surface of the neutral electrode, but rather can be greater at the proximal corners or edges to which the current flows than at the distal corners or edges, attention should always be paid during application of neutral electrodes that the current flows toward the long edge.

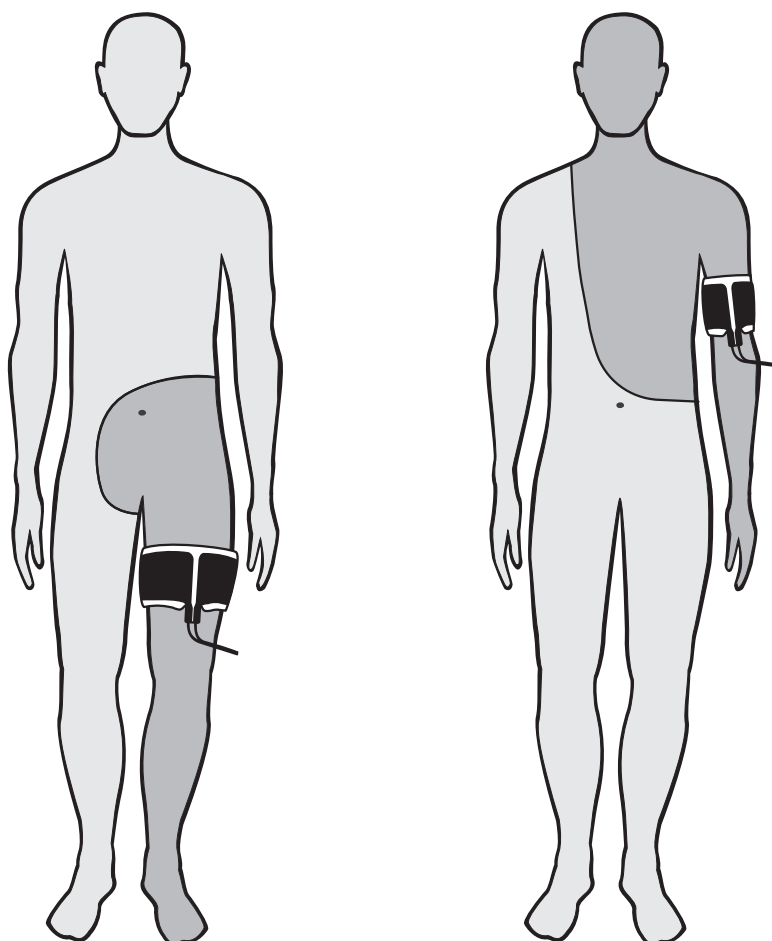
NESSY compares the intensity of the two partial currents I_1 and I_2 of the high-frequency current I_{HF} , which flow through the two partial surfaces of the neutral electrode. If the partial currents I_1 and I_2 deviate from one another, the red NESSY signal is illuminated. If the partial currents deviate extremely from one another, the red NESSY signal is illuminated and at the same time the NESSY warning signal is heard, and the HF generator is automatically switched off.



Neutral electrode suitable for NESSY - applied correctly



Neutral electrode suitable for NESSY - applied incorrectly



Correct application

The correct application must be observed not only for divided, but also for undivided neutral electrodes.

WARNING

Before the neutral electrode is applied to the patient's body, a check must be made as to whether the green NESSY signal (LED) does not light when using a neutral electrode with two contact surfaces.

4.3.6 Protection against operating error

To prevent operating errors, the front panel is designed in such a way that illogical and/or incomplete settings are automatically monitored and signaled.

The female connector beneath the front panel contains all the connecting sockets for the applied part.

These connecting sockets are designed in such a way that only plugs from intended accessories can be inserted (provided that only accessories recommended or supplied by the manufacturer of the unit are used).

You may connect three instruments at the same time to the ICC. For reasons of safety, these can however only be used alternately. Only one socket ever carries HF voltage.

Each time after switching on the power switch, an automatic test program is started within the unit which recognizes and signals the following errors in the operating controls for the unit and for accessories connected to the unit:

1. If a key on the front panel is shorted or pressed due to an error when the power switch is switched on, this error is indicated acoustically and by an Error Number after the power switch has been switched on.
2. If a key on the electrode handle is shorted or bypassed at low resistance due to an error (e.g. by moisture in the electrode handle) or pressed while the power switch is switched on, this error is signaled acoustically and indicated by an Error Number after switching on the power switch.
3. If a footswitch contact is shorted due to an error, a pedal sticks or a pedal is pressed while the power switch is switched on, this error is indicated acoustically and by an Error Number.

CAUTION

Every function field can only then be activated if it has been completely set. If an attempt is made to activate a function field which has not or not completely been set, the unit produces an intermittent acoustic warning signal and indicates this operating error by illumination of the triangle symbols on the corresponding function field.

5 ERBOTOM ICC 350 Z

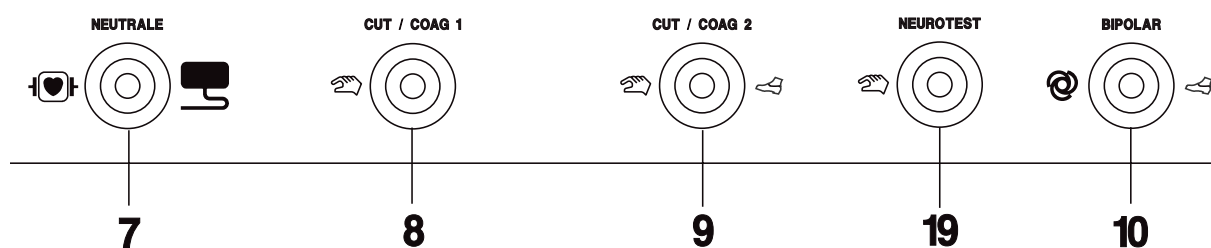
5.1 Intended use

The ERBOTOM ICC 350 Z is equipped with a Neurotest device which is used to localize electrically excitable tissue structures.

5.2 Additional controls

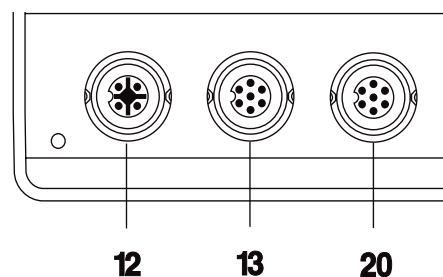
19 Connecting socket for the active Neurotest electrode on the front panel

To prevent a mix-up of the electrode handles for high-frequency surgery and the electrode handle for the Neurotest device, electrode handles no. 20190-027, 20190-061 for the Neurotest device are equipped with a different plug than the electrode handles for high-frequency surgery. It is connected to socket 19. The silver needle for nerve test no. 20191-079 is inserted into the electrode handle.



20 Connecting socket for remote control of the Neurotest setting on the rear panel

The Neurotest device is switched on, and the current pulse amplitudes are adjusted using a remote control no. 20121-007 which is connected to this socket.

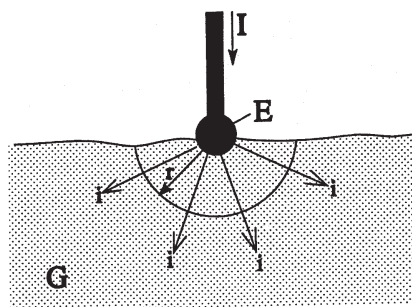


5.3 Operation

Basics

The NEUROTTEST device in the ERBOTOM ICC 350 Z is used for intraoperative differentiation of electrically stimulable tissue structures, for example the facial nerve, during surgical operations in dental, oral and maxillofacial medicine (DOM). Here, an electric stimulation in the form of periodical current pulses is applied to the tissue to be differentiated and any reaction of the stimulated muscle is observed.

The possibility of localization of motor nerves and/or muscles using electric current pulses in electrically conductive tissue structures G is based upon the physical circumstance that electric current flows divergently into the tissue from the stimulation electrode E , i.e. the current density i in the tissue decreases as the distance increases from the stimulation electrode, i.e. inversely as the square of the distance r .



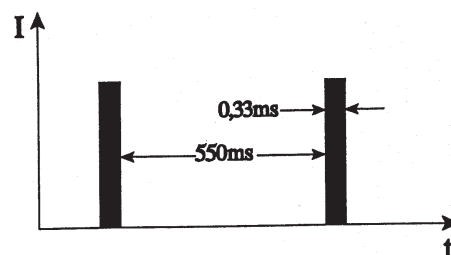
Consequently, due to this physical condition, a localization of motor nerves and/or muscles is all the more precise the smaller the intensity of the current I is. The implication of this for the practical localization of electrically excitable tissue structures is that a relatively high current intensity permits a fast but imprecise localization, and a relatively low current intensity allows a more time-consuming but therefore more precise localization.

The application of current pulses during DOM

The current pulses can be applied monopolarly via a coagulation electrode. The current returns to the unit via a neutral electrode applied to the patient.

Form of the current pulses

The NEUROTTEST device supplies square-wave current pulses with 0.33 ms pulse duration and 550 ms pause duration. The amplitude of the current pulses can be set to a maximum of 25 mA.



Activation of current pulses during DOM

The Neurotest device is switched on and set via a remote control connected to the rear panel of the unit.

If the knob for this remote control is set to switch position 0, the Neurotest device is switched off. This is indicated by the signal lamp labelled HF. For switch positions 1-5, the Neurotest device is switched on and can be activated via the Neurotest electrode handle. This is indicated by the signal lamp labelled NT.

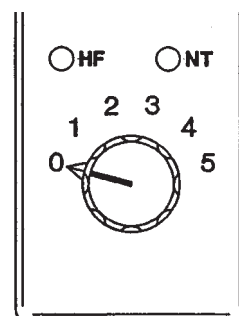
The stimulation current pulses from the NEUROTTEST device are transmitted via the electrode handle with electrode connected to the NEUROTTEST socket. It is activated via the key on the Neurotest electrode handle.

The Neurotest device can only be activated in switch positions 1-5 on the remote control.

Setting the intensity of the current pulses

The intensity of the current pulses can be set from 5 to 25 mA in five steps of 5 mA each. The respectively set intensity is automatically and constantly controlled within the practically expected resistance range.

Step 1	=	05 mA	from 0 to	20.0	kOhm
Step 2	=	10 mA	from 0 to	10.0	kOhm
Step 3	=	15 mA	from 0 to	6.6	kOhm
Step 4	=	20 mA	from 0 to	5.0	kOhm
Step 5	=	25 mA	from 0 to	4.0	kOhm



Signaling of the current pulses

It is a prerequisite for clear identification of electrically stimutable tissue structures that current pulses are actually present. If the unit did not provide any current pulses, for example due to an interruption in the cables unnoticed by the user, and consequently no stimulation occurs, this could erroneously lead to the belief that no electrically stimutable tissue structures are present in the affected area.

For this reason, the NEUROTTEST device only produces acoustic signals (beeps) if the current pulses are flowing with at least 3 mA. Current pulses can only flow if the stimulation electrode is in contact with electrically conductive tissue and the circuit is closed by the patient via the neutral electrode.

Safety of the NEUROTTEST device

The following safety-related functions of the NEUROTTEST device in the ERBOTOM ICC 350 Z are automatically monitored:

- When activating the NEUROTTEST device, a test is first made as to whether a neutral electrode is connected to the unit and to the patient (the latter only if a neutral electrode with two contact surfaces is used). If there is an error, this is signaled visually and acoustically.
- During every activation of the NEUROTTEST device, the pulse generator is monitored for unit-related output error. Here, every pulse is automatically monitored. If the amplitude of a pulse is greater or less than the currently set amplitude, the unit produces warning signals. If the amplitude of a pulse exceeds a maximum value, the output circuit is automatically switched off immediately. If the amplitude was so high that the electronic fuse was triggered, this error is indicated by error no. 90.
- Every time after switching on the NEUROTTEST device, the function of the electronic fuse hardware is automatically tested. If an error in the electronic fuse hardware is determined, this is indicated for a few seconds by error no. 91.

- d) The maximum activation time for the NEUROTTEST device is automatically limited for reasons of safety. After 80 seconds of uninterrupted activity, the “time limit” visual signal is illuminated and after a further 10 seconds, the Neurotest device is automatically deactivated. However, the Neurotest device can be immediately reactivated after this.

5.4 Technical data

NEUROTTEST device in the ERBOTOM ICC 350 T	
Pulse waveform	square
Pulse duration	0.33 ms
Pause length	550 ms
Pulse amplitude	Step 1 = 05 mA
	Step 2 = 10 mA
	Step 3 = 15 mA
	Step 4 = 20 mA
	Step 5 = 25 mA
Constancy of the amplitude	automatically controlled
Acoustic signals	synchronous with the current pulses from at least 3 mA
Prevention of unit-related output error	yes

6 ERBOTOM ICC 350 T

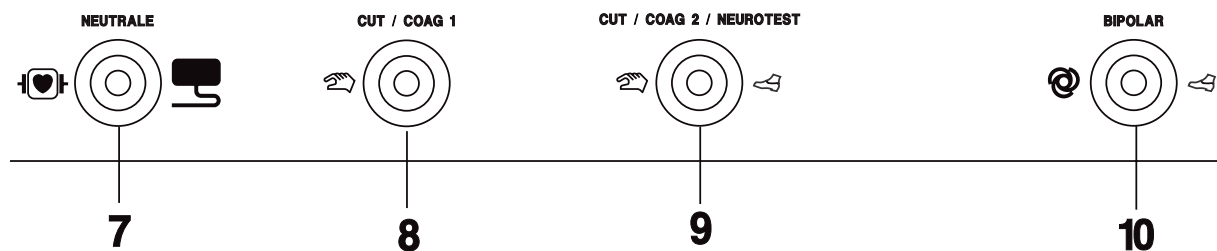
6.1 Intended use

The ERBOTOM ICC 350 T is equipped with a Neurotest device which is used to localize electrically excitable tissue structures.

6.2 Additional controls

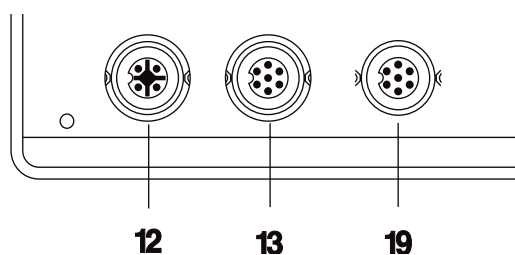
9 Connecting socket for the active Neurotest electrode on the front panel

Electrode handles for cutting and coagulation are also connected to this socket.



19 Connecting socket for remote adjustment of the Neurotest setting on the rear panel

The Neurotest device is switched on, and the current pulse amplitudes are adjusted using a remote control no. 20191-007 which is connected to this socket.

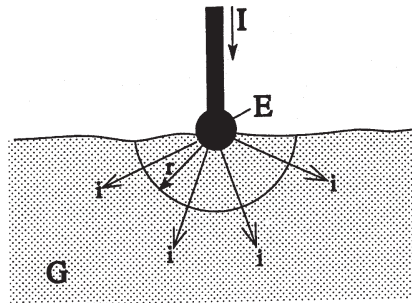


6.3 Operation

Basics

The NEUROTTEST device in the ERBOTOM ICC 350 Z is used for intraoperative differentiation of electrically stimulable tissue structures, for example the external sphincter during transurethral resections (TUR) of the prostate. Here, an electric stimulation in the form of periodical current pulses is applied to the tissue to be differentiated and any reaction of the stimulated muscle is observed.

The possibility of localization of motor nerves and/or muscles using electric current pulses in electrically conductive tissue structures G is based upon the physical circumstance that electric current flows divergently into the tissue from the stimulation electrode E , i.e. the current density i in the tissue decreases as the distance increases from the stimulation electrode, i.e. inversely as the square of the distance r .



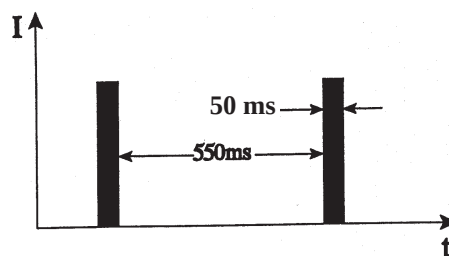
Consequently, due to this physical condition, a localization of motor nerves and/or muscles is all the more precise the smaller the intensity of the current I is. The implication of this for the practical localization of electrically excitable tissue structures is that a relatively high current intensity permits a fast but imprecise localization, and a relatively low current intensity allows a more time-consuming but therefore more precise localization.

The application of current pulses during TUR

The current pulses can be applied monopolarly via a coagulation electrode. The current returns to the unit via a neutral electrode applied to the patient for the TUR.

Form of the current pulses

The NEUROTTEST device supplies square-wave current pulses with 50 ms pulse duration and 550 ms pause duration. The amplitude of the current pulses can be set to a maximum of 25 mA.



Activation of current pulses during TUR

The Neurotest device is switched on and set via a remote control connected to the rear panel of the unit. Via this remote control, the operating mode of the unit can be switched over from high-frequency surgery (HF) to Neurotest (NT).

If the knob on the remote control is set at switch position 0, the unit is in the high-frequency surgery operating mode. This is indicated by the signal lamp labelled HF. For switch positions 1-5, the unit is in the Neurotest operating mode. This is indicated by the signal lamp labelled NT. In addition, there is a display on the front panel of the ICC 350 T.

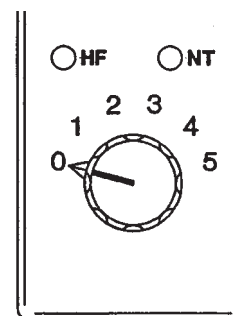
The stimulation current pulses of the Neurotest device are transmitted via the electrode handle with electrode connected to the CUT/COAG2/NEUROTTEST socket. This is activated via the yellow pedal on the footswitch. The Neurotest device can only be activated in switch positions 1-5 on the remote control.

The high-frequency surgery operating mode is only active in switch position 0 on the remote control or when the remote control is not connected.

Setting the intensity of the current pulses

The intensity of the current pulses can be set from 5 to 25 mA in five steps of 5 mA each. The respectively set intensity is automatically and constantly controlled within the practically expected resistance range.

Step 1	=	05 mA	from 0 to	20.0	kOhm
Step 2	=	10 mA	from 0 to	10.0	kOhm
Step 3	=	15 mA	from 0 to	6.6	kOhm
Step 4	=	20 mA	from 0 to	5.0	kOhm
Step 5	=	25 mA	from 0 to	4.0	kOhm



Signaling of the current pulses

It is a prerequisite for clear identification of electrically stimutable tissue structures that current pulses are actually present. If the unit did not provide any current pulses, for example due to an interruption in the cables unnoticed by the user, and consequently no stimulation occurs, this could erroneously lead to the belief that no electrically stimutable tissue structures are present in the affected area.

For this reason, the NEUROTTEST device only produces acoustic signals (beeps) if the current pulses are flowing with at least 3 mA. Current pulses can only flow if the stimulation electrode is in contact with electrically conductive tissue and the circuit is closed by the patient via the neutral electrode.

Safety of the NEUROTTEST device

The following safety-related functions of the NEUROTTEST device in the ERBOTOM ICC 350 T are automatically monitored:

- a) When activating the NEUROTTEST device, a test is first made as to whether a neutral electrode is connected to the unit and to the patient (the latter only if a neutral electrode with two contact surfaces is used). If there is an error, this is signaled visually and acoustically.

- b) During every activation of the NEUROTTEST device, the pulse generator is monitored for unit-related output error. Here, every pulse is automatically monitored. If the amplitude of a pulse is greater or less than the currently set amplitude, the unit produces warning signals. If the amplitude of a pulse exceeds a maximum value, the output circuit is automatically switched off immediately. If the amplitude was so high that the electronic fuse was triggered, this error is indicated by error no. 90.
- c) Every time after switching on the NEUROTTEST device, the function of the electronic fuse hardware is automatically tested. If an error in the electronic fuse hardware is determined, this is indicated for a few seconds by error no. 91.
- d) The maximum activation time for the NEUROTTEST device is automatically limited for reasons of safety. After 80 seconds of uninterrupted activity, the “time limit” visual signal is illuminated and after a further 10 seconds, the Neurotest device is automatically deactivated. However, the Neurotest device can be immediately reactivated after this.

6.4 Technical data

NEUROTTEST device in the ERBOTOM ICC 350 T	
Pulse waveform	square
Pulse duration	50 ms
Pause length	550 ms
Pulse amplitude	Step 1 = 05 mA
	Step 2 = 10 mA
	Step 3 = 15 mA
	Step 4 = 20 mA
	Step 5 = 25 mA
Constancy of the amplitude	automatically controlled
Acoustic signals	synchronous with the current pulses from at least 3 mA
Prevention of unit-related output error	yes

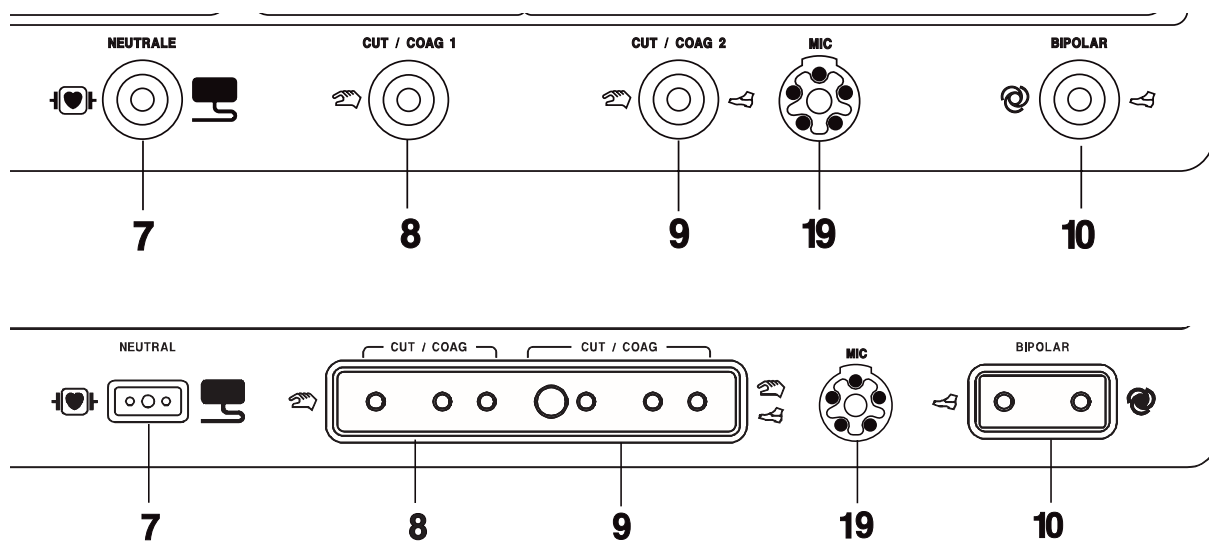
7 ERBOTOM ICC 350 M

7.1 Intended use

As a complement to the ICC 350, the ERBOTOM ICC 350 M is intended for the operation of multifunctional instruments with pneumatic actuator and MIN instruments. For this, it is equipped with the programs C = MIC (minimally invasive surgery) and n = MIN (minimally invasive neurosurgery) and additional controls.

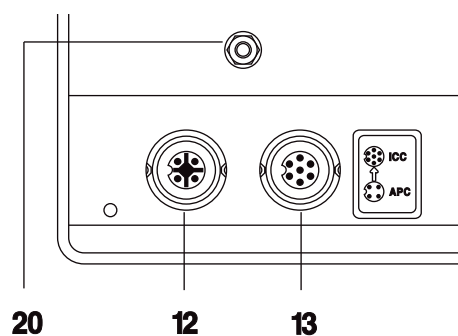
7.2 Additional controls

19 Connecting socket for multifunctional MIC instruments and MIN instruments



20 Compressed air input from an external compressed air source

As an external compressed air source, a compressed air bottle or the central compressed air supply in the OR can be used, for example. The pressure should be at least 4 bar and at most 6 bar.



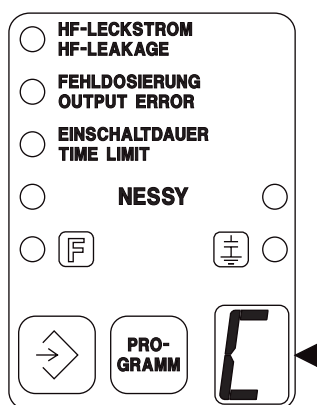
CAUTION 

Use only dry compressed air.

To connect the unit to the central compressed air supply or to a compressed air bottle, use the ERBE compressed air tube No. 20 128-000 (5 m long) or No. 20 128-001 (1 m long).

7.3 Operation

Program C = MIC (Minimally Invasive Surgery)



The “C” program is intended for the operation of multifunctional instruments with pneumatic actuator on the MIC connecting socket. In this program, the parameters for multifunctional instruments can be set. Functions which are irrelevant or even impermissible for the operation of such instruments are limited or switched off according to the instrument.

Settings

(e.g. for instrument 1)

The limitations for other instruments are described in the instrument instruction manual.

AUTO CUT	The HF output power for cutting with the instrument can be limited in 1 watt steps from 40 watts to 1 watt. EFFECT can be set from 1 to 3. AUTO CUT is blocked for electrode handles with 2 keys that are connected to the CUT/COAG 1 socket.
AUTO COAG 1	This function field is not limited and all parameters can be set.
AUTO COAG 2	The HF power output for SOFT can be limited in 1 watt steps from 120 watts to 1 watt. For FORCED from 60 watts to 1 watt. SPRAY is blocked. Activation of AUTO STOP during SOFT is possible. Electrode handles with 2 keys that are connected to the CUT/COAG 2 socket cannot activate the unit.
AUTO BIPOLAR	This function field is blocked. In the display, the position of the needle of the multifunctional instrument appears. “-nd” means needle extended, “nd” needle withdrawn.

Operation of multifunctional instruments with pneumatic actuator on an Erbotom ICC 350 M

1. Installation

- 1.1 Connect the ERBOTOM ICC 350 M to a compressed air source with 5 +/- 1 bar. As a compressed air source, the central compressed air supply of the OR can be used. To connect the ERBOTOM ICC 350 M to the standard gas supply outlet according to DIN 13 260 Part 2 in the operating room, use one of the following ERBE compressed air tubes:

ERBE compressed air tube, 5 m long, Article No. 20128 - 000

ERBE compressed air tube, 1 m long, Article No. 20128 - 001

- 1.2 If the multifunctional instrument is equipped with aspiration and/or irrigation channels, these must be connected to the appropriate aspiration and/or irrigation devices.

WARNING

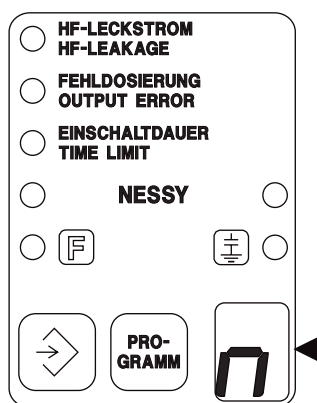
If the aspiration and/or irrigation channels of a multifunctional instrument are not used during application in insufflated bodily cavities, the terminals for these channels must be closed with Luer-lock caps.

2. Connect the multifunctional instrument to the ERBOTOM ICC 350 M.

The ERBOTOM ICC 350 M is equipped with an **Instrument Identification System (IIS)**. As soon as a multifunctional instrument is connected to the MIC socket (19), the **IIS** automatically checks which instrument it is and briefly displays the code number of the respective instrument. Then the **IIS** calls up the program defined and stored for this instrument, whereby the ERBOTOM ICC 350 M is automatically configured especially for this instrument. If an instrument without coding is connected to the MIC socket, the ERBOTOM ICC 350 M remains in the basic configuration of the “C” program.

The front panel settings for both the basic configuration of the “C” program and also the instrument-specific configurations can be changed manually, although the setting possibilities are limited specific to the instrument in consideration of the safety of the patients and the electrical load capacity of the instruments.

Program n = MIN (Minimally Invasive Neurosurgery)



The “n” program is intended for operating MIN probes on the MIC connecting socket. In this program, the parameters for these probes can be set. Functions that are irrelevant or even impermissible for the operation of such instruments are limited or switched off according to the instrument.

Settings

(e.g. for instrument 1)

The limitations for other instruments are described in the respective Notes on use.)

AUTO CUT The HF power output for cutting with the instrument can be limited in 1 watt steps from 15 watts to 1 watt. EFFECT can be set from 1 to 4. AUTO CUT is blocked for electrode handles with 2 keys that are connected to the CUT/COAG 1 socket.

AUTO COAG 1 This function field is not limited and all parameters can be set.

AUTO COAG 2 The HF power output for SOFT can be limited in 1 watt steps from 15 watts to 1 watt. FORCED and SPRAY are blocked. Activation of AUTO STOP during SOFT is possible. Electrode handles with 2 keys that are connected to the CUT/COAG 2 socket cannot activate the unit.

AUTO BIPOLAR This function field is not limited and all parameters can be set.

7.4 Technical data

Programmability	
Program n = MIN	Custom programmable by the user
Program "C" = MIC	Custom programmable by the user
Programming	Via key on the front panel
Program storage	Via key on the front panel
Calling up program	Via key on the front panel

Compressed air terminal	
Required pressure	5 ± 1 bar

8 ERBOTOM ICC 350 M-DOKU

8.1 Intended use

As a supplement to the ICC 350, the ERBOTOM ICC 350 M-DOKU is intended for the operation of multifunctional instruments with pneumatic actuator and MIN instruments. For this, it is equipped with the programs C = MIC (minimally invasive surgery) and n = MIN (minimally invasive neurosurgery) and additional controls.

Furthermore, this high-frequency surgical unit can be connected to a PC. With the PC and the DOKU program, the parameters of the unit can be recorded via accessories during activation.

Regarding the functions of the MIC / MIN, please read Chapter 7.

8.2 DOKU system

With a PC and the DOKU program, the parameters of the unit (voltage, current, resistance, power, cosine Phi, spark intensity and energy over time) can be recorded during activation via the accessories (optical waveguide cable, optical waveguide box). There is no electrical connection between the computer and the ICC 350 M-DOKU, since communication is via optical waveguide.

Installation

1. Connect the optical waveguide box to the COM1 interface of the computer using the 9-pin Sub-D cable.
2. Switch on the computer and the ICC 350.
3. Connect the optical waveguide cable to the optical waveguide box. On the other end of the optical waveguide cable, one of the two connecting plugs lights up in red.
4. Connect the illuminated connecting plug with the non-illuminated optical waveguide socket of the ICC 350.
5. Connect the other connecting plug from the optical waveguide cable to the illuminated connecting socket of the ICC 350.

Set-up instructions

The PC or the laptop with the optical waveguide box must be set up outside the prescribed patient surroundings. This means further than 1.5 m from the patient table. The distance to other units in the OR and the ICC 350 M-DOKU must also be greater than 1.5 m. The computer, the optical waveguide box and the keyboard must not be able to be touched from the patient surroundings.

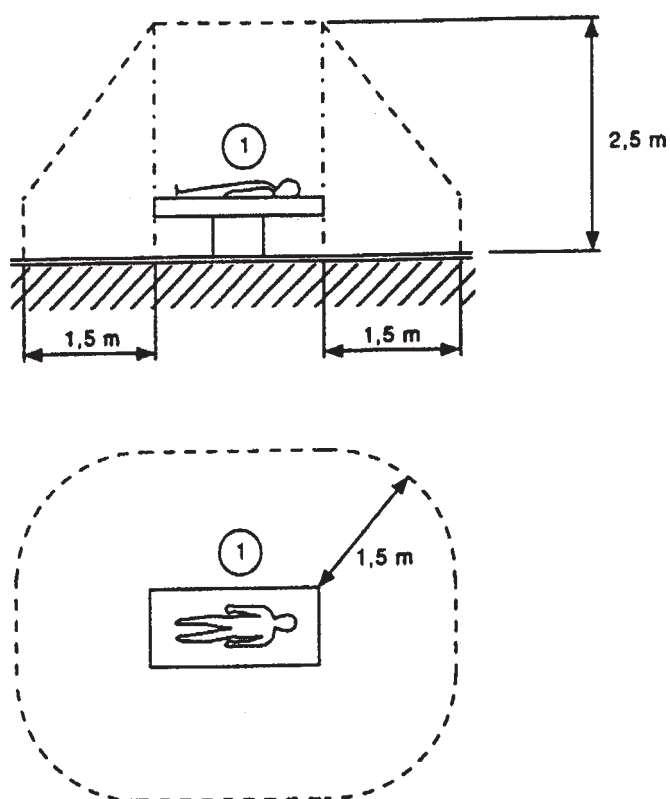


The computer must never be placed on or under the ICC 350. The minimum distance of 1.5 m to the patient, the units, the OR and the ICC 350 absolutely must be maintained.

The length of the optical waveguide cable is sufficient to connect the optical waveguide box to the ICC 350 M-DOKU. The computer and the plug-in power supply unit for the optical waveguide box are supplied with system voltage via a permanently installed power outlet. The ICC 350 is supplied with system voltage via another permanently installed power outlet.

WARNING

The computer, the plug-in power supply unit for the optical waveguide box and the ICC 350 M-DOKU must never be supplied together with system voltage via a multiple power outlet.



Instruction manual for the documentation program

Hardware requirements

Mouse: serial

PC: AT,386,486,586.

Graphics: EGA,VGA.

COM 1 interface.

ICC with V24 interface with 8251 and TOSLINK optocoupler interface.

Connection to ICC (9 pin Sub-D connector) and to PC (COM 1 connector)

PIN 1: Ground PIN 7: Ground

PIN 3: TxT PIN 3: TxT

PIN 2: RxT PIN 2: RxT

Protocol parameters

Baud rate: 19,200
Start bit: 1
Data bit: 8
Stop bit: 1
Parity: even, no

Software installation

Two files are provided, ICC3.EXE and EGAVGA.BGI.
EGAVGA: graphic driver.
ICC3.EXE: ICC 350 documentation program.
Program start with ICC3.exe

IMPORTANT

The program only runs reliably in DOS.

ICC 350 incision image program

The activation time for the incision image registration is 32 seconds max.. If activated for longer, the messages "Protocol error" and ERROR 73 appear.

Function keys in the main menu

F1 or **F8**: *Incision management.*

The incisions are automatically numbered in sequence. In incision management, an incision can be loaded using F1. The incision data and the unit settings are displayed in the main menu for the loaded incision.

F3: *Activation readiness.*

The PC is ready to receive incision data. The ICC and the PC constantly check the incision location. As soon as the connection is OK, the message "ICC connection OK" appears and a point is seen on the seven-segment display for the ICC program number.

F9: *Incision image display.*

With F9, the diagram for the displayed incision number is shown.

F10: *Quit.*

Program end.

Function keys in the incision image display

In the upper half, the program shows a sectional enlargement. The section shown is marked in the lower half by two vertical lines. The section can be shifted using the mouse or the cursor keys.

F1: *Display diagram HF output voltage ON or OFF.*

The voltage is displayed in effective volts.

F2: *Display diagram HF output current ON or OFF.*

The actual output current is displayed in mA.

F3: *Display diagram resistance ON or OFF.*

The resistance is limited to 30 kOhm in the diagram.

F4: *Display diagram power ON or OFF.*

The actual power is calculated from current, voltage and $\cos \phi$.

F5: *Display diagram phase shifting ON or OFF.*

Phase shifting between voltage and current
from 0..90 degrees. 0 degrees: actual. 90 degrees: capacitive.

F6: *Display diagram spark measurement value ON or OFF.*

The spark measurement value is between 0 and 100.

F7: *Display diagram energy ON or OFF.*

Energy = $P \cdot t$ in [Ws].

The total energy for the incision image is also displayed in the compound probability diagram.

F8: *Call-up diagram compound probability.*

F10: *Quit.*

End, return to main menu.

Function keys in the compound probability diagram.

F1, F2, F3, F4, F8 and F9: *change color.*

F10: *Quit.*

End, return to diagram display.

9 TECHNICAL DATA, SIGNALS, DIAGRAMS

9.1 Technical data

Cutting, monopolar with automatic voltage control (AUTO CUT)	
HF voltage waveform	unmodulated sinusoidal alternating voltage
Crest factor C, at $R_L = 500$ ohms	$C = 1.4$ for all settings
Rated frequency	330 kHz
Maximum HF voltage at load resistance $R_L = \infty$	$650 V_p$
Dynamic internal impedance in rated load range	0 ohm
Constancy of the HF voltage at $R_L > 350$ ohms	automatically controlled
Cutting quality	4 coagulation effects selectable by key
Constancy of the 4 coagulation effects	automatically controlled
HF rated power	300 watts at $R_L = 500$ ohms
HF power limitation	1 to 300 watts in 1 watt steps
Setting of the HF power limitation	via up/down keys
Display of the HF power limitation	7-segment display, 3 decimal places
Precision of the HF power limitation	+/- 1 digit or +/- 15%
Activation of the Cutting mode	by key or pedal
HF connecting sockets	2, electronically locked from one another

Cutting, monopolar with automatic arc control (HIGH CUT)	
HF voltage waveform	unmodulated sinusoidal alternating voltage
Crest factor C, at $R_L = 500$ ohms	$C = 1.4$ for all settings
Rated frequency of the HF voltage	330 kHz
Maximum HF voltage at load resistance $R_L = \infty$	$570 V_p$
Constancy of the intensity of the electric arc	automatically controlled
Cutting quality	4 coagulation effects selectable by key
Constancy of the 4 coagulation effects	automatically controlled
HF rated power	300 watts at $R_L = 500$ ohms
HF power limitation	1 to 300 watts in 1 watt steps
Setting of the HF power limitation	via up/down keys
Display of the HF power limitation	7-segment display, 3 decimal places
Precision of the HF power limitation	+/- 1 digit or +/- 15%
PPS (Power Peak System)	yes
Activation of the Cutting mode	by key or pedal
HF connecting sockets	2, electronically locked from one another

Cutting, monopolar with automatic voltage control (Program "b")	
HF voltage waveform	unmodulated sinusoidal alternating voltage
Crest factor C, at $R_L = 500$ ohms	$C = 1.4$ for all settings
Rated frequency	330 kHz
Maximum HF voltage at load resistance $R_L = \infty$	$550 V_p$
Dynamic internal impedance in rated load range	0 ohm
Constancy of the HF voltage at $R_L > 350$ ohms	automatically controlled
Cutting quality	4 coagulation effects selectable by key
Constancy of the 4 coagulation effects	automatically controlled
HF rated power	120 watts at $R_L = 125$ ohms
HF power limitation	1 to 100 watts in 1 watt steps
Setting of the HF power limitation	via up/down keys
Display of the HF power limitation	7-segment display, 3 decimal places
Precision of the HF power limitation	+/- 1 digit or +/- 15%
PPS (Power Peak System)	yes
Activation of the bipolar cutting mode	pedal
HF outlet socket	bipolar

CUTTING / ENDO CUT	
Automatic arc-triggered, fractionated incision	
Basic setting	$t_{on} = 50 \text{ ms}$, $t_{off} = 750 \text{ ms}$

Soft coagulation (SOFT COAG)	
HF voltage waveform	unmodulated sinusoidal alternating voltage
Crest factor C, at $R_L = 500 \text{ ohms}$	$C = 1.4$ for all settings
Rated frequency of the HF voltage	330 kHz
Peak value of the HF voltage	max. 1900 V _p
Constancy of the HF voltage	automatically controlled
HF rated power	120 watts at 125 ohms
HF power limitation (P_{HFmax})	from 1 watt to 120 watts in 1 watt steps
Setting of the HF power limitation	via up/down keys
Display of the HF power limitation	7-segment display, 3 decimal places
Precision of the HF power limitation	+/- 1 digit or +/- 15%
Activation of the Cutting mode	by key or pedal
HF connecting sockets	2, electronically locked from one another

Forced coagulation (FORCED COAG)	
HF voltage waveform	pulse-modulated alternating voltage
Crest factor C, at $R_L=500 \text{ ohms}$	$C = 5$ at 120 W _{max} , $C = 11$ at 5 W _{max}
Rated of the HF voltage	1 MHz
Peak value of the HF voltage Version 1	max. 1,300 V _p
Peak value of the HF voltage Version 2	max. 2,300 V _p
Peak value of the HF voltage Version 3	max. 2,300 V _p
Peak value of the HF voltage Version 4*	max. 2,600 V _p
HF rated power	120 watts at $R_L=350 \text{ ohms}$
HF power limitation	from 1 watt to 120 watts in 1 watt steps
Setting of the HF power limitation	via up/down keys
Stability of the HF power	see Diagram Forc. Coag. power via R_L
Display of the HF power limitaiton	7-segment display, 3 decimal places
Precision of the HF power limitation	+/- 1 digit or +/- 15%
Activation of the Forced coagulation	by key or pedal
HF connecting sockets	2, electronically locked from one another

Spray coagulation (SPRAY COAG)	
HF voltage waveform	pulse-modulated alternating voltage
Crest factor C, at $R_L=500 \text{ ohms}$	$C = 7$ at 120 W _{max} , $C=15$ at 5 W _{max}
Rated frequency of the HF voltage	1 MHz
Peak value of the HF voltage	max. 4 kV _p
HF rated power	120 watts at 500 ohms
HF power limitation	from 1 watt to 120 watts in 1 watt steps
Setting of the HF power limitation	via up/down keys
Display of the HF power limitation	7-segment display, 3 decimal places
Precision of the power limitation	+/- 1 digit or +/- 15%
Activation of the Spray coagulation	by key or pedal
HF connecting sockets	2, electronically locked from one another

*) not ICC 350 T, Z

Bipolar coagulation (AUTO BIPOLAR)	
HF voltage waveform	unmodulated sinusoidal alternating voltage
Crest factor C, at $R_L=500$ ohms	$C = 1.4$ for all settings
Rated frequency	330 kHz
Peak value of the HF voltage	$190 V_{p \max}$
Constancy of the HF voltage at $R_L > 50$ ohms	automatically controlled
HF rated power	120 watts at 125 ohms
HF power limitation ($P_{HFmax.}$)	from 1 watt to 120 watts in 1 watt steps
Setting of the HF power limitation	via up/down keys in 1 watt steps
Display of the HF power limitation	7-segment display, 3 decimal places
Precision of the HF power limitation	+/- 1 digit or +/-15%
Activation of the Bipolar coagulation	by pedal or Auto Start
Auto Start delay	0 = 0 sec., 1 = 0.5 sec., 2 = 1 sec. selectable
Auto Stop ON/OFF	by key
HF connecting socket	1

Safety features	
Protection class according to EN 60 601-1	I
Type according to EN 60 601-1	CF
Switching of the neutral electrode	can be changed over: capacitive grounding or floating output
Monitoring of single-surface neutral electrodes	Automatic monitoring of the electrical connection between the neutral electrode and high-frequency surgical unit
Monitoring of dual-surface neutral electrodes	Automatic monitoring a) of the electrical connection between the neutral electrode and high-frequency surgical unit and b) between the neutral electrode and patient c) of the symmetry of the HF partial currents i_{HF1} / i_{HF2} d) of the HF current I_{HF} as a function of the contact resistance $R_{\bar{u}}$ between the partial surfaces of the neutral electrode
Max. resistance $R_{\bar{u}}$ between the partial surfaces and of a divided neutral electrode	120 ohms $\pm$ 20 ohms
Warning signals S_w as a function of I_{HF} and $R_{\bar{u}}$	see Diagram $S_w = f (I_{HF} , R_{\bar{u}})$
Monitoring of the HF output parameters	HF voltage, HF current, HF power Error display in safety field
Limitation of the max. HF power	adjustable
Auto. limitation of the max. activation time limit	yes, display in safety field
Auto. performance check	Self check after switching on the unit
Automatic monitoring of LF leakage currents in a monopolar applied part with a capacitively grounded neutral electrode	yes, warning signals as of 0.05 mA
Automatic monitoring of the HF leakage currents in a monopolar applied part	yes, warning signals as of 150 mA

Programmability	
Program 0	Programmed by the manufacturer
Program 1 to 9	Custom programmable by the user
Program "b" = bipolar Cutting/Coagulation	Custom programmable by the user
Program "E" = Endo Cut	Custom programmable by the user
Programming	Via keys on the front panel
Program storage	Via keys on the front panel
Program call-up	Via keys on the front panel

Documentation	
Automatic storage of operating errors	yes
Automatic storage of function errors	yes
Automatic storage of safety errors	yes

Power connection	
Rated power voltage	240 V / 230 V / 115 V / 110 V / 100 V $\pm$ 10 %
Rated power frequency	50 / 60 Hz
Power current	4.0 A at 230 - 240 V / 8.0 A at 100 - 115 V
Power consumption in Standby mode	25 watts
Power consumption at max. HF power	620 watts 920 VA
Current consumption in Standby mode	150 mA at 230 - 240 V / 300 mA at 100 - 115 V
Potential equalization terminal	yes
Power fuses	2 slow burn, 4 A at 230 - 240 V / 8 A at 100 - 115 V

Classification according to EC Directive 93/42/EEC	
Class	IIb

Dimensions, weight	
W x H x D	410 x 152 x 368 mm
Weight	10 kg

Environmental conditions for shipping and storage of the unit	
Temperature	-40°C to + 70°C
Air humidity, relative	30% to 95%

Environmental conditions for operation of the unit	
Temperature	+10°C to + 40°C
Air humidity, relative	30% to 75%, noncondensing

9.2 Visual and acoustic signals

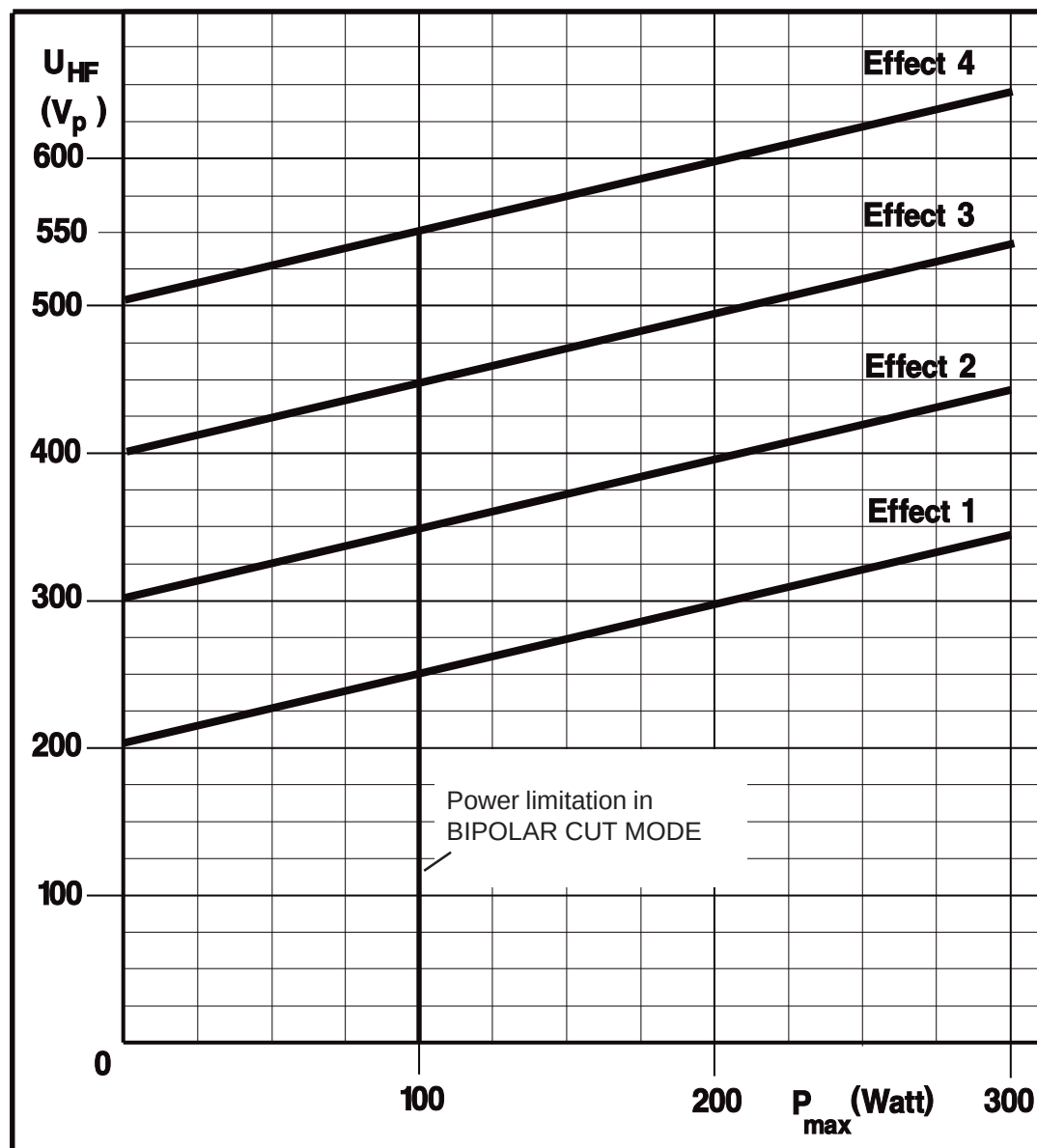
STATUS	visual	acoustic	HF off
Power switch on	•		
Operating error on the front panel	••	••	••
HF generator on	••	••	
LF leakage current greater than 0.05 mA	•• Error No.5	••	••
HF leakage current greater than 150 mA, but less than 300 mA	•• red		
HF leakage current greater than 300 mA	•• red Error No. 17	••	
Output error	•• red	••	••
Max. activation time limit reached	•• red		
Max. activation time limit exceeded too long	•• red	••	••
No neutral electrode connected to the unit	•• red Error No.13	••	••
Single-surface electrode connected to the unit	• green		
Dual-surface neutral electrode connected to unit and contact resistance between the contact surfaces less than 120 ohms	• green		
Dual-surface neutral electrode not applied to patient or contact resistance between the contact surfaces and patient greater than 120 ohms	•• red Error No.13	••	••
HF current relative to the contact resistance between the contact surfaces of a dual-surface neutral electrode and patient too great	•• red Error No.19	•• 4 times	
HF partial currents of the contact surfaces of a dual-surface neutral electrode different	•• red		
HF partial currents of the contact surfaces of a single-surface neutral electrode too different	•• red Error No.21	••	••
Interruption of the line between unit and neutral electrode or between patient and dual-surface neutral electrode during HF activation	•• red Error No.13	••	••
Auto Stop for Auto Coagulation		••	••
Activation error	••	••	••
Error message upon error recognition during self check	•	•	•

- These signals are produced regardless of whether the unit is activated or not activated.
- These signals are produced only if the unit is activated.

9.3 Diagrams

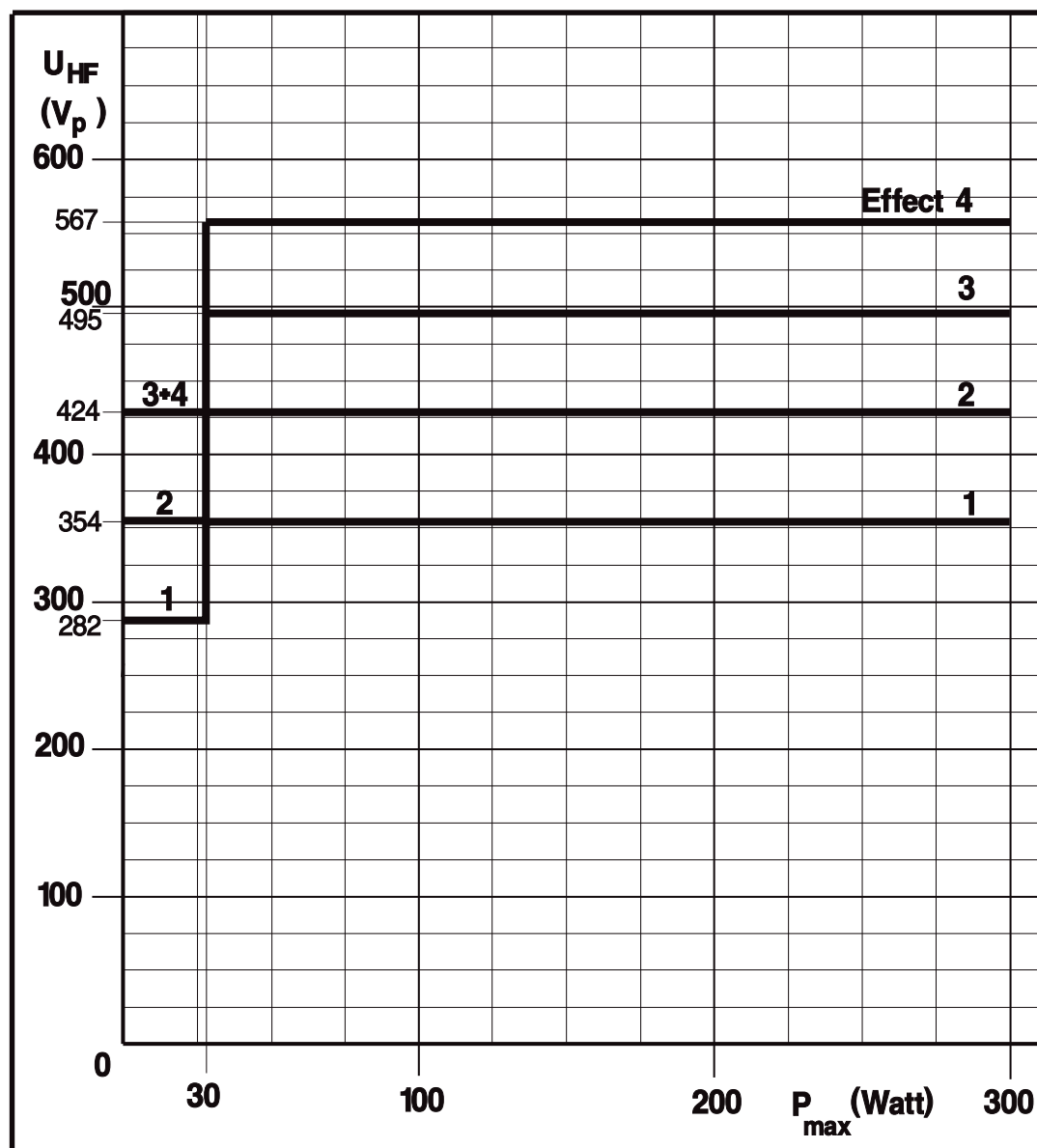
AUTO CUT MODE, Effect 1, 2, 3, 4 BIPOLAR CUT MODE

Peak value of the HF output voltage U_{HF} at no load, as a function of the power limitation P_{max} for EFFECT 1 to 4.



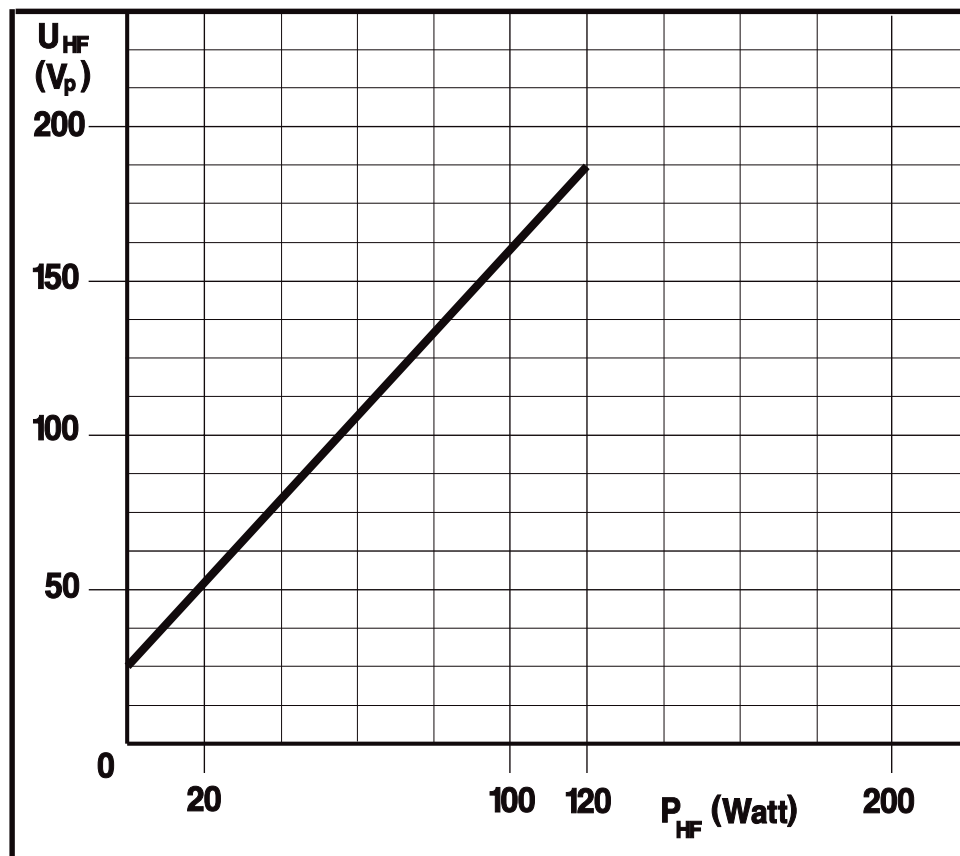
HIGH CUT, Effect 1, 2, 3, 4

Peak value of the HF output voltage U_{HF} at no load, as a function of the power limitation P_{max} for EFFECT 1 to 4.



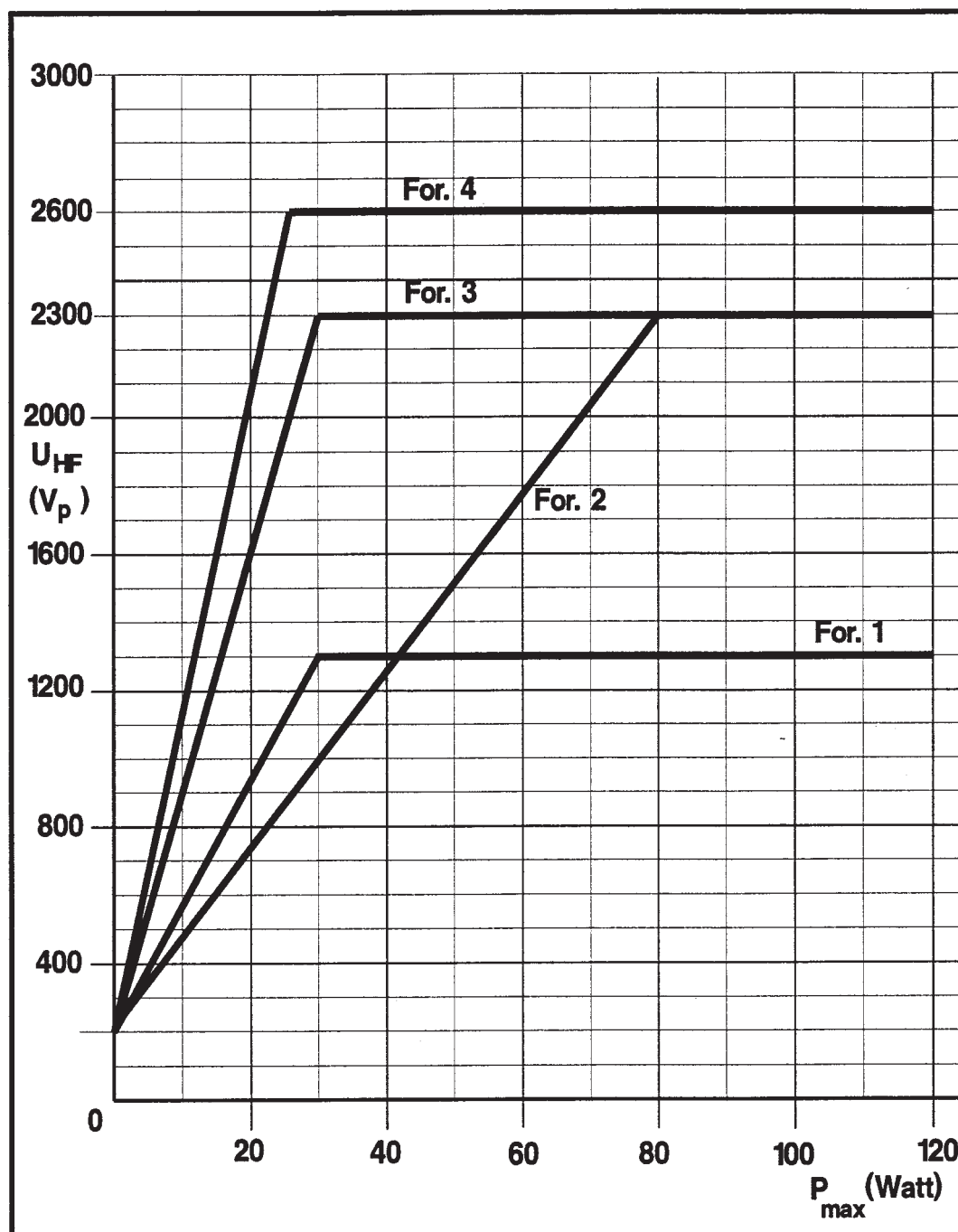
SOFT COAGULATION AUTO BIPOLAR

Peak value of the HF output voltage U_{HF} at no load, as a function of the power limitation P_{max} .



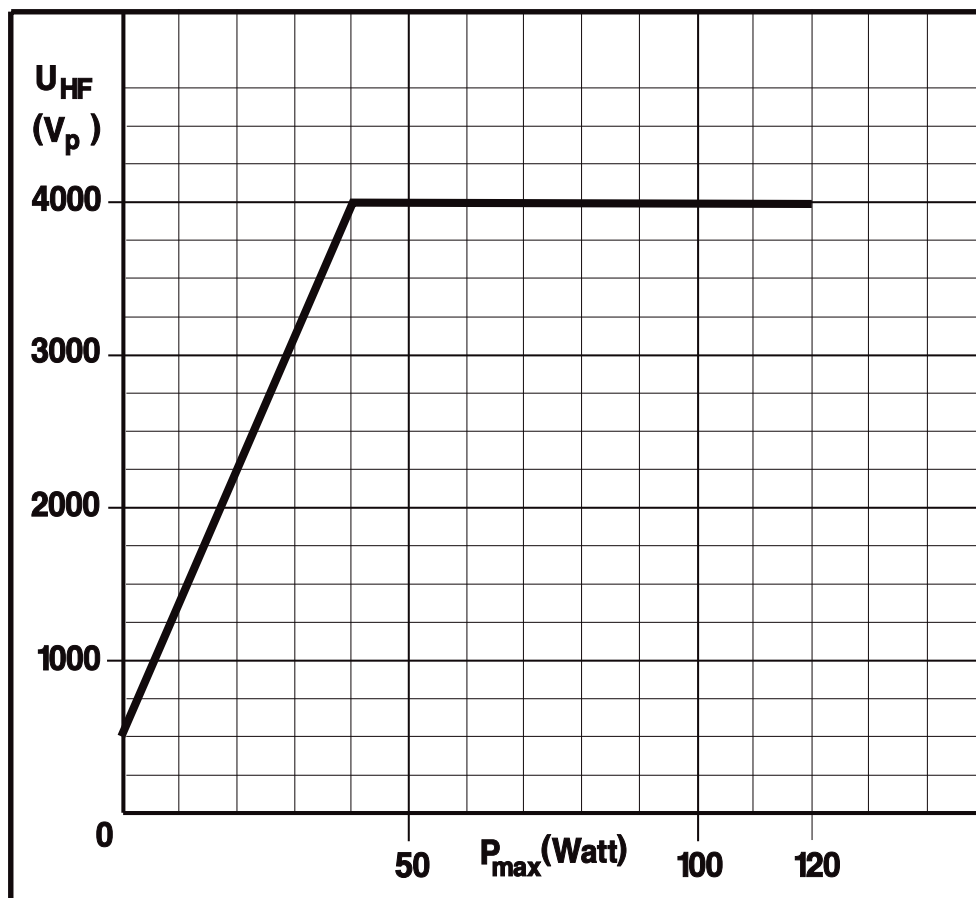
FORCED COAGULATION (For. 4 not ICC 350 T, Z)

Peak value of the HF output voltage U_{HF} at no load, as a function of the power limitation P_{max} .



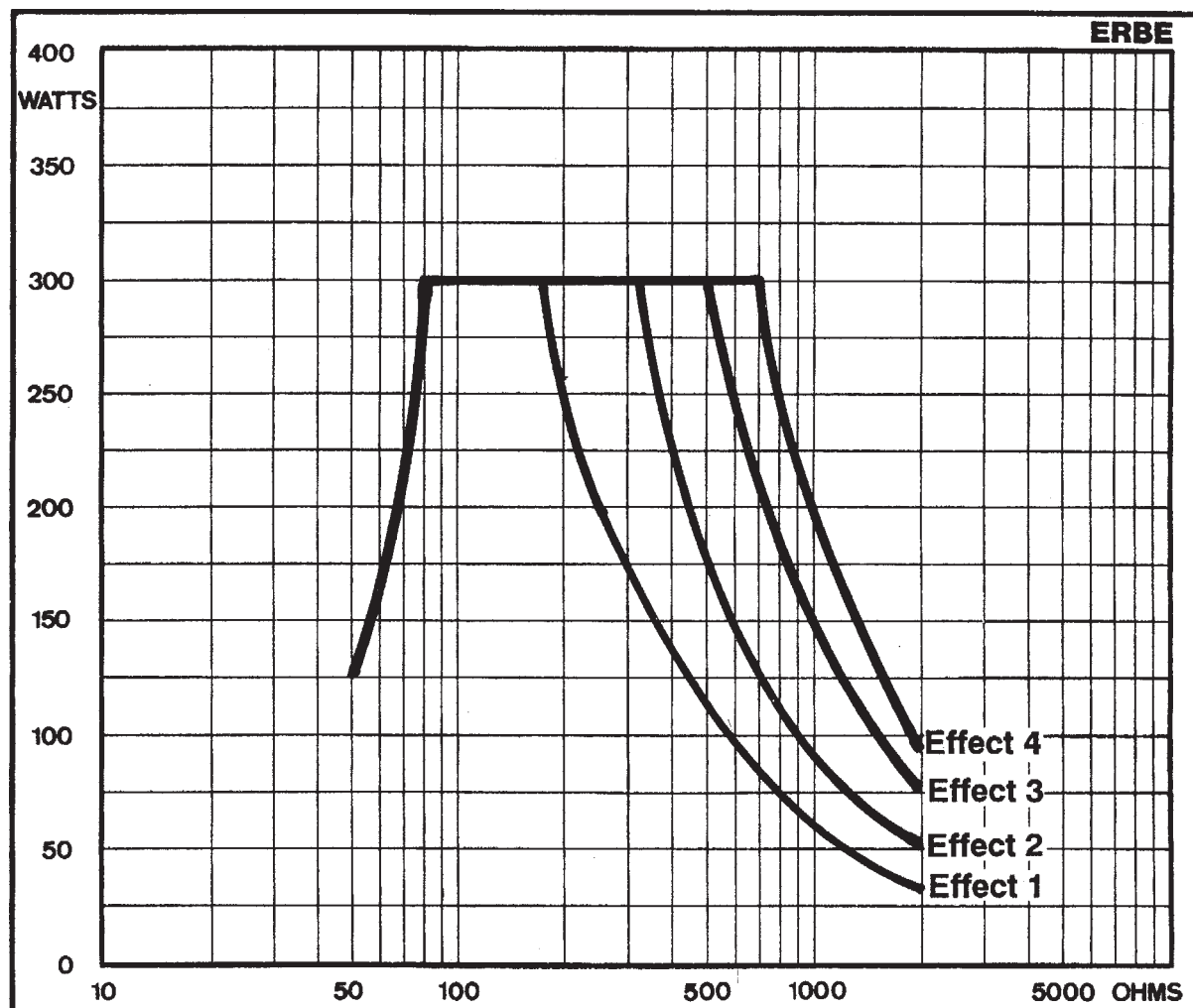
SPRAY COAGULATION

Peak value of the HF output voltage U_{HF} at no load, as a function of the power limitation P_{max} .



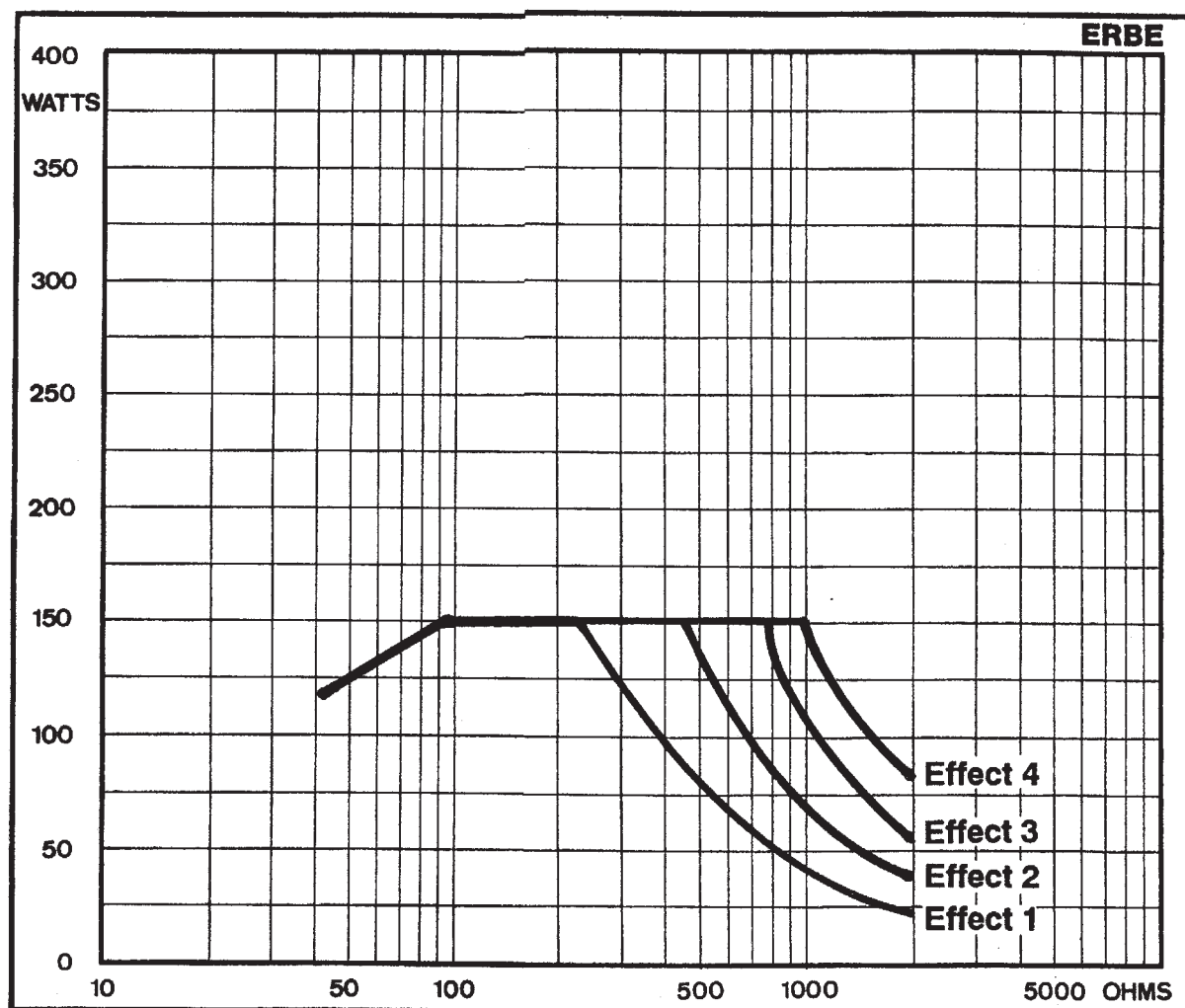
CUT MODE, Effect 1, 2, 3, 4

Power output as a function of load resistance
for power limitation of 300 watts



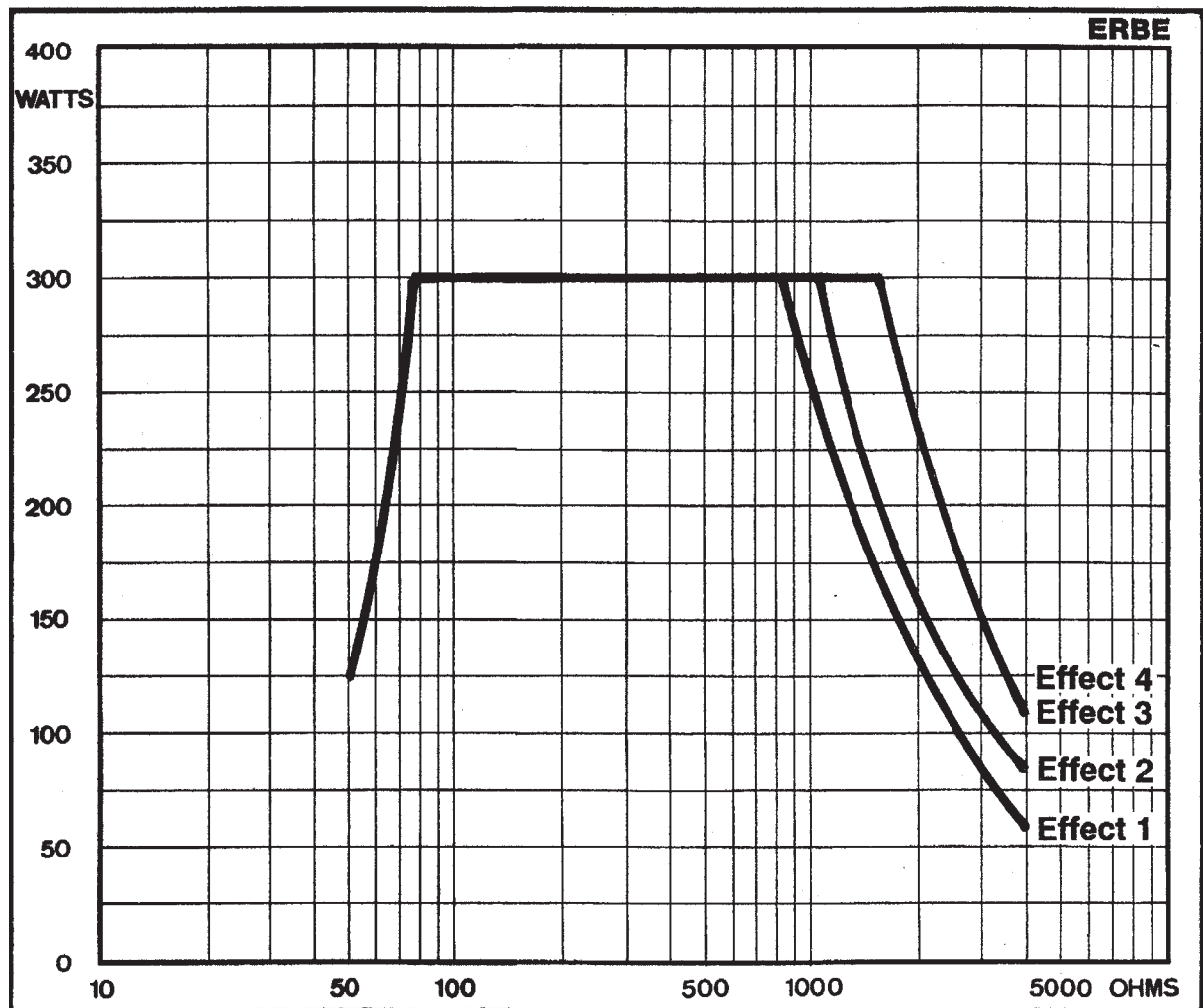
CUT MODE, Effect 1, 2, 3, 4

Power output as a function of load resistance
for power limitation of 150 watts



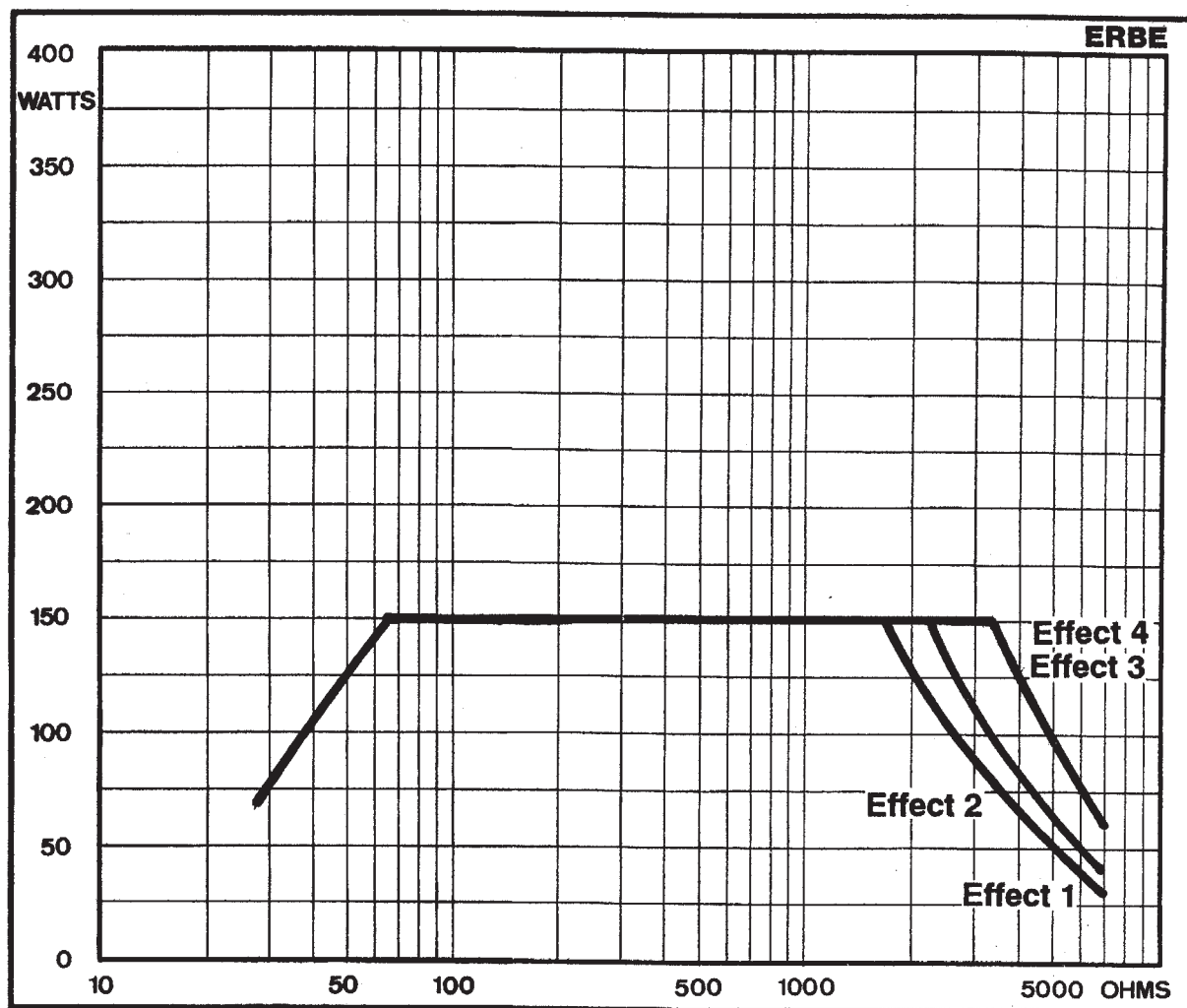
HIGH CUT, Effect 1, 2, 3, 4

Power output as a function of load resistance
for power limitation of 300 watts



HIGH CUT, Effect 1, 2, 3, 4

Power output as a function of load resistance
for power limitation of 150 watts

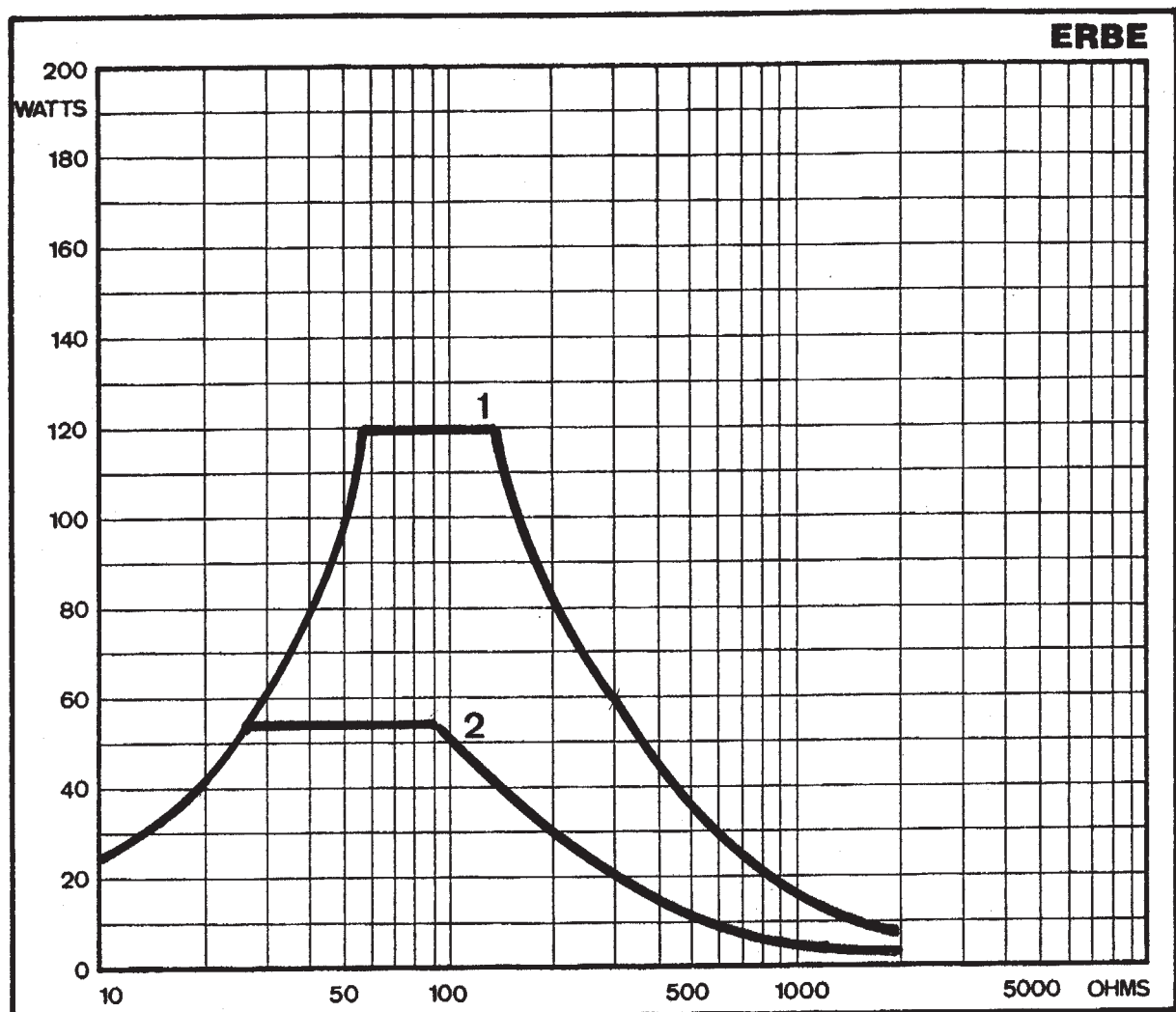


SOFT COAGULATION AUTO BIPOLAR

Power output as a function of load resistance for

1) power limitation of 120 watts

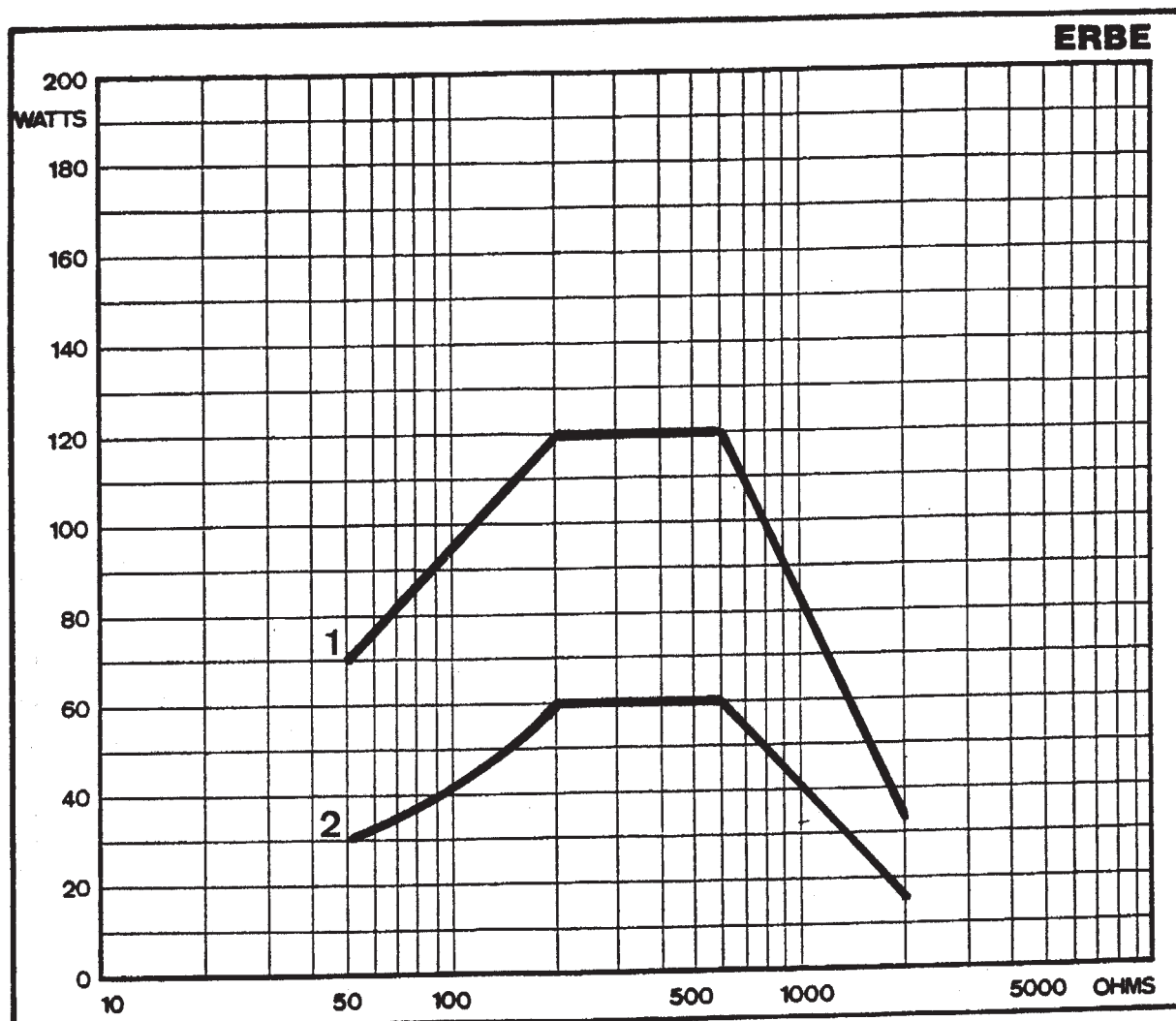
2) power limitation of 60 watts



FORCED COAGULATION

Power output as a function of load resistance for

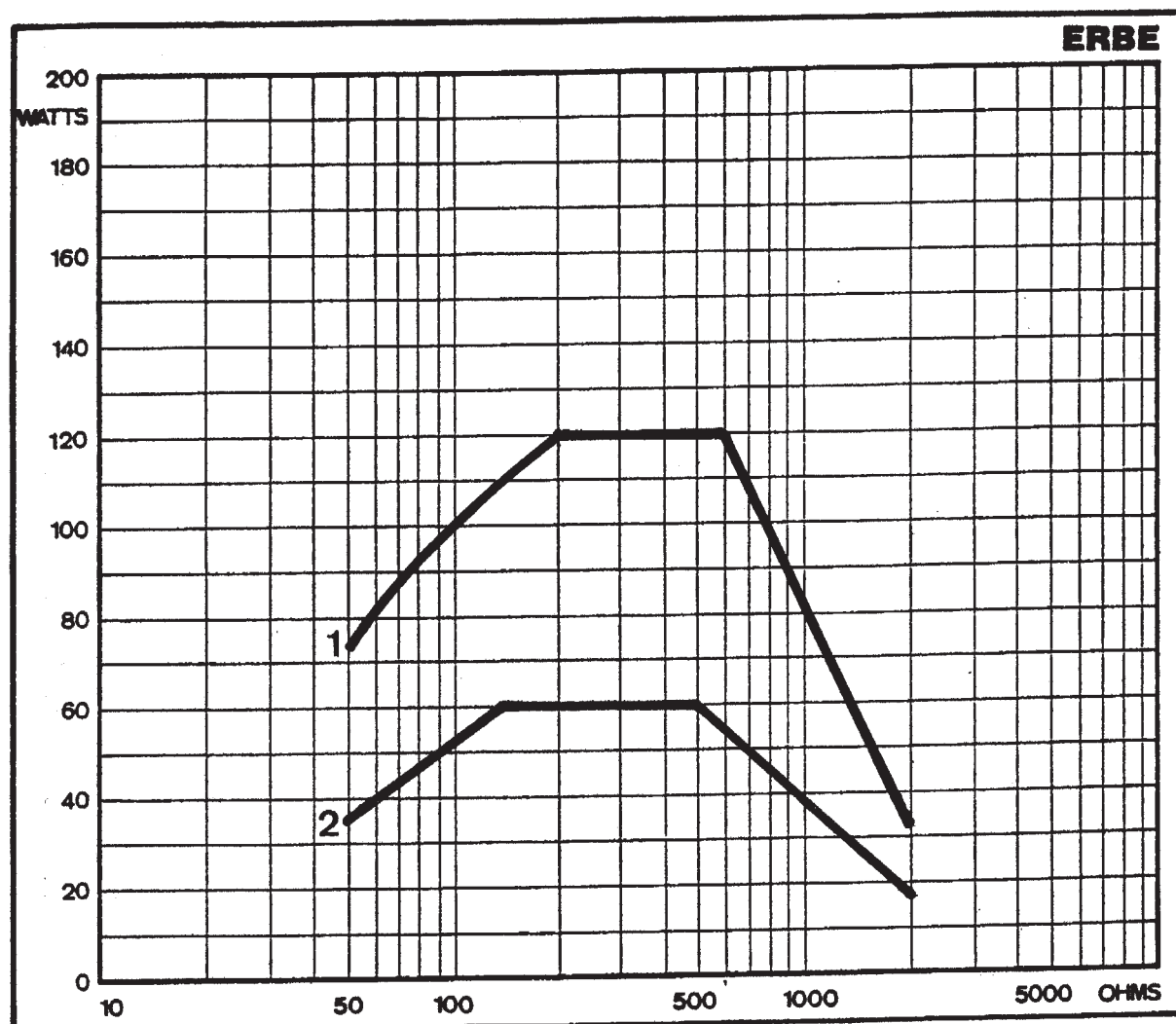
- 1) power limitation of 120 watts
- 2) power limitation of 60 watts



SPRAY COAGULATION

Power output as a function of load resistance for

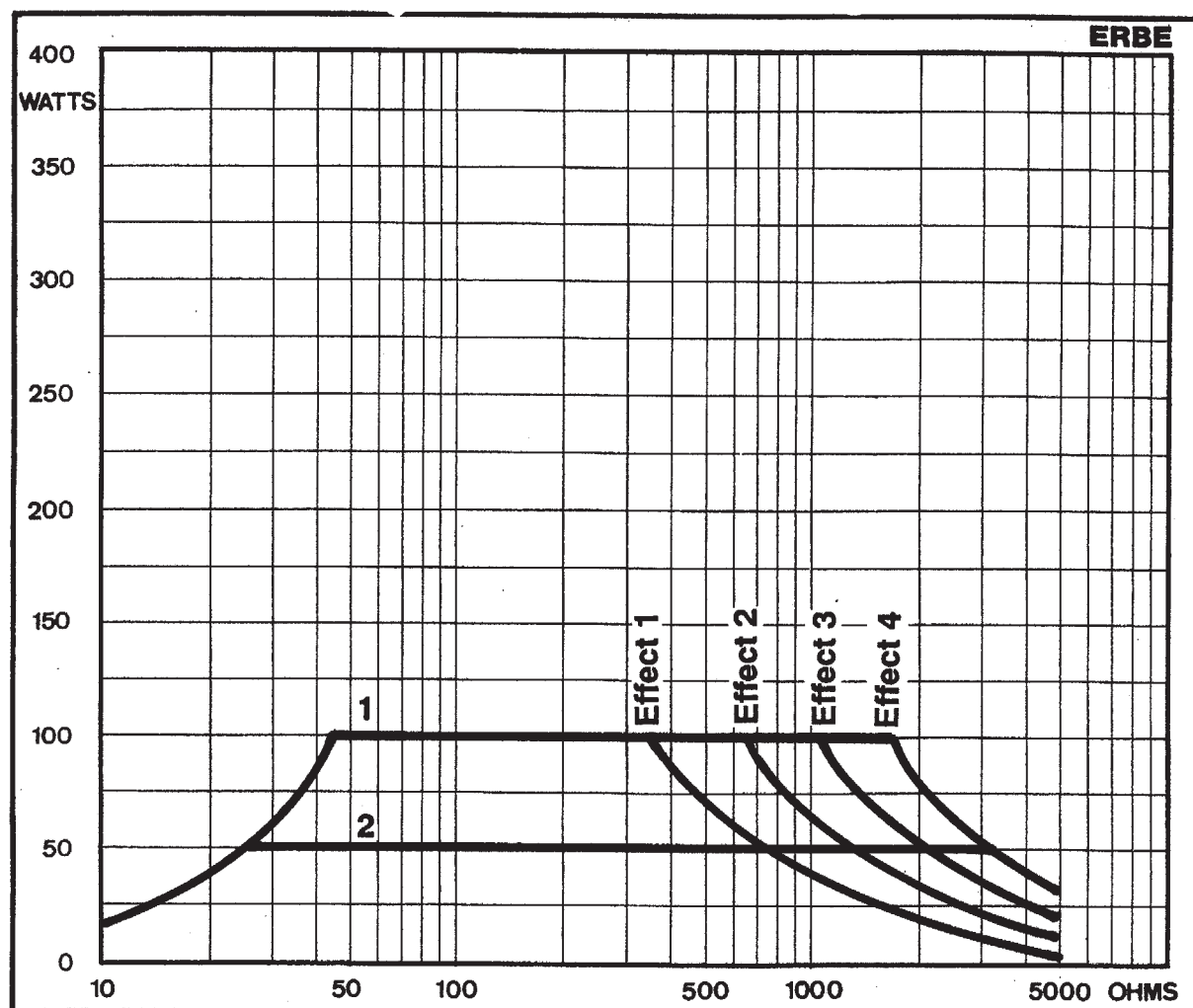
- 1) power limitation of 120 watts
- 2) power limitation of 60 watts



BIPOLAR CUT MODE

Power output as a function of load resistance for

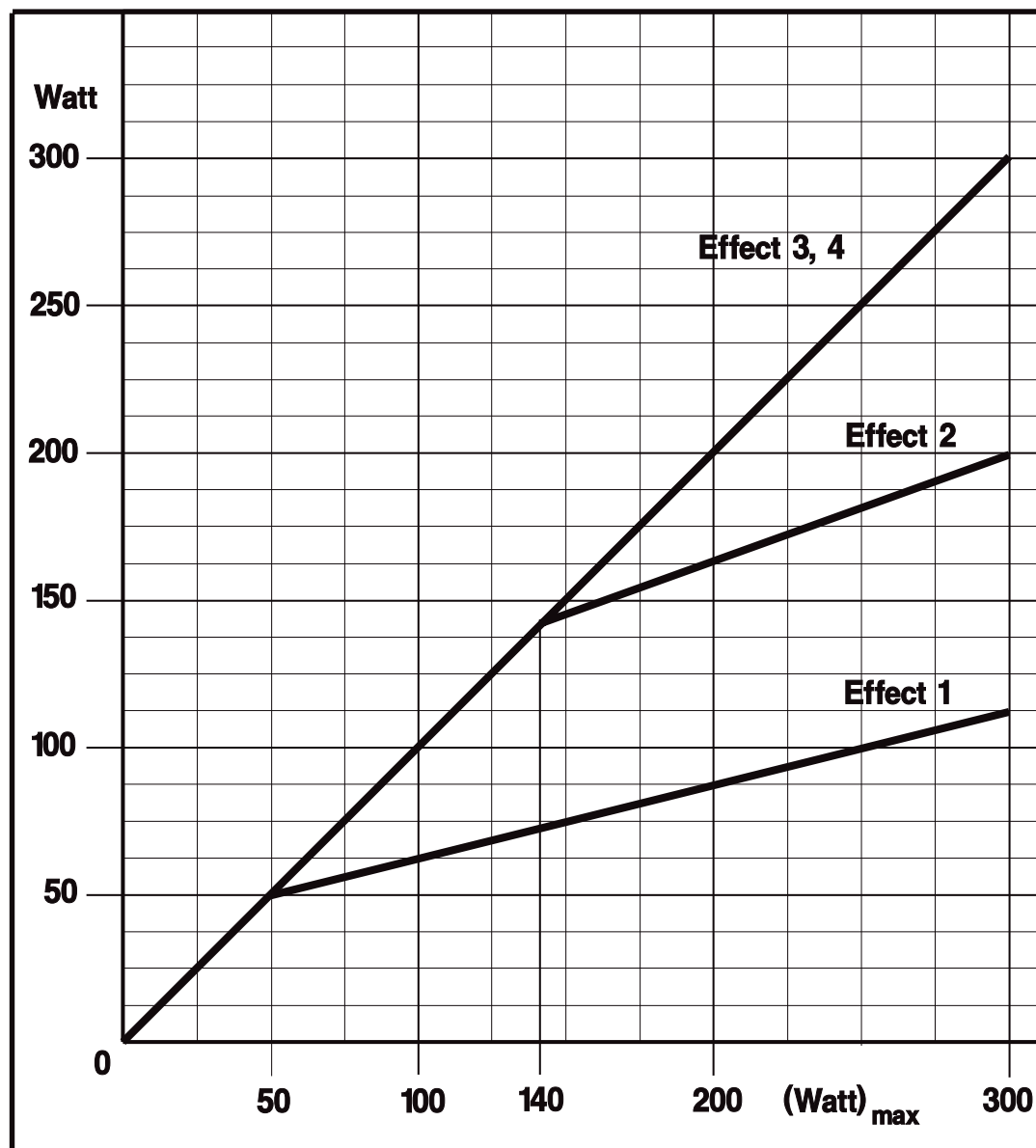
- 1) power limitation of 100 watts
- 2) power limitation of 50 watts



AUTO CUT MODE, Effect 1, 2, 3, 4

Power output as a function of the power limitation

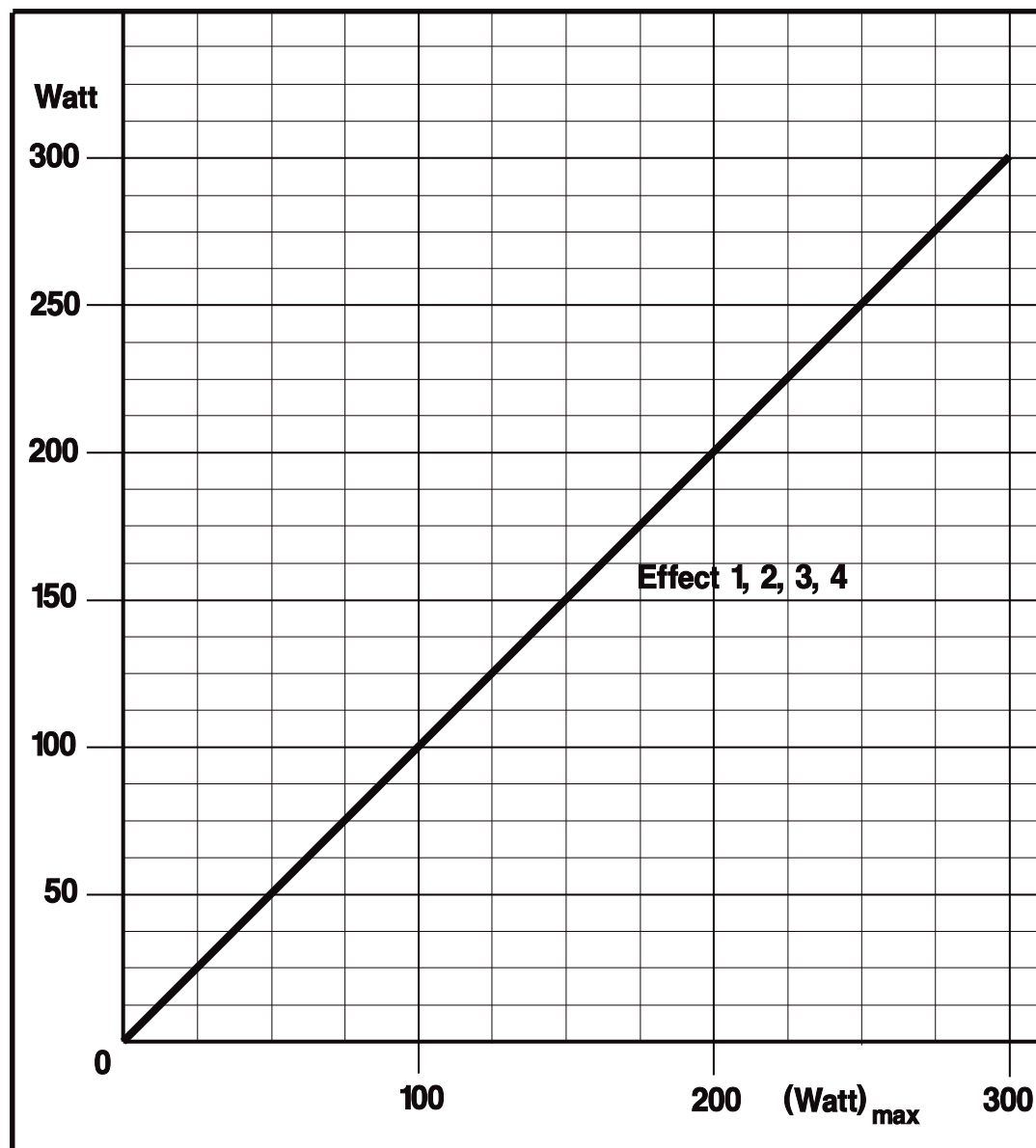
$R_L = 500$ ohms



HIGH CUT, Effect 1, 2, 3, 4

Power output as a function of the power limitation

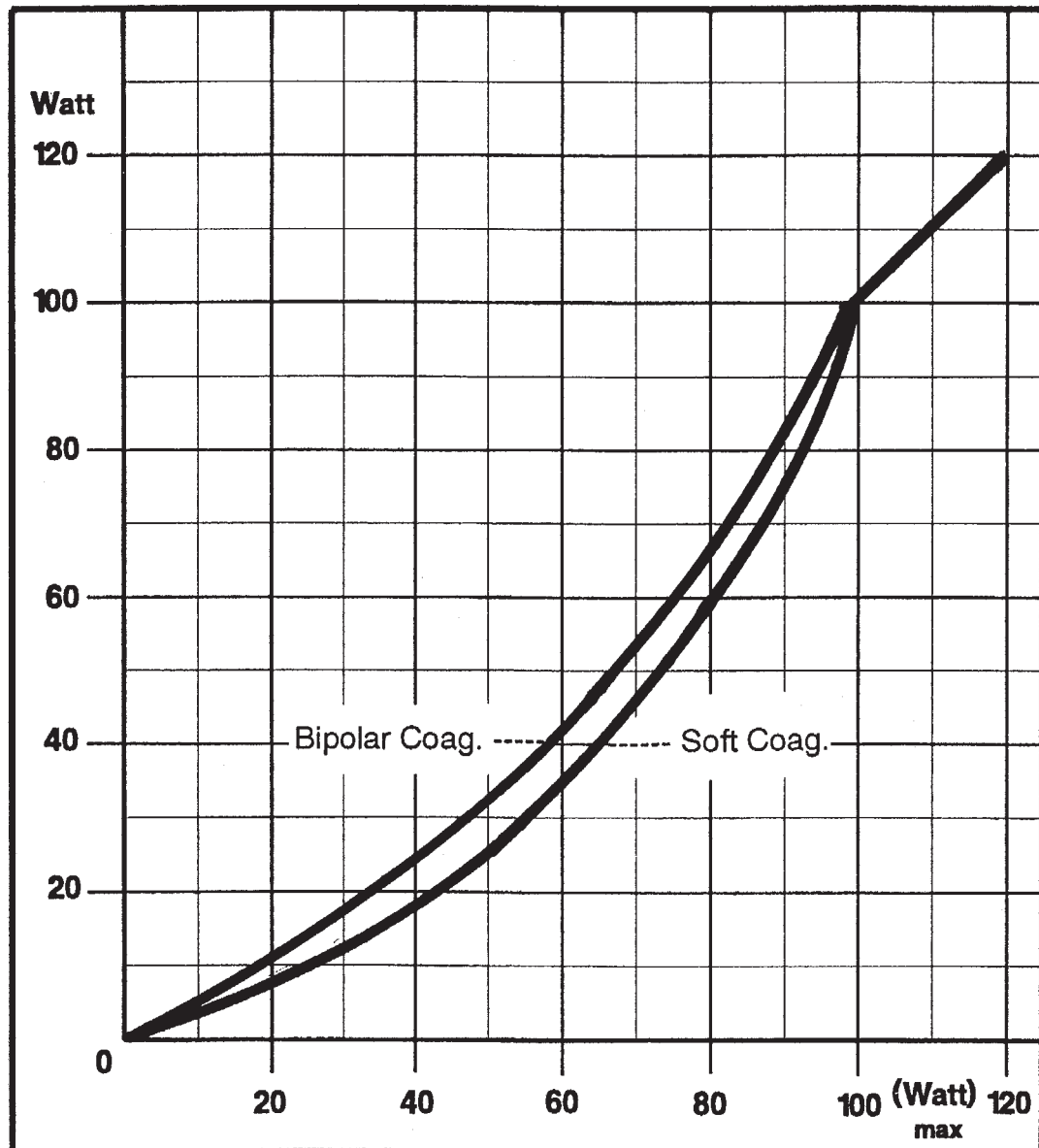
$R_L = 500$ ohms



SOFT COAGULATION AUTO BIPOLAR

Power output as a function of the power limitation

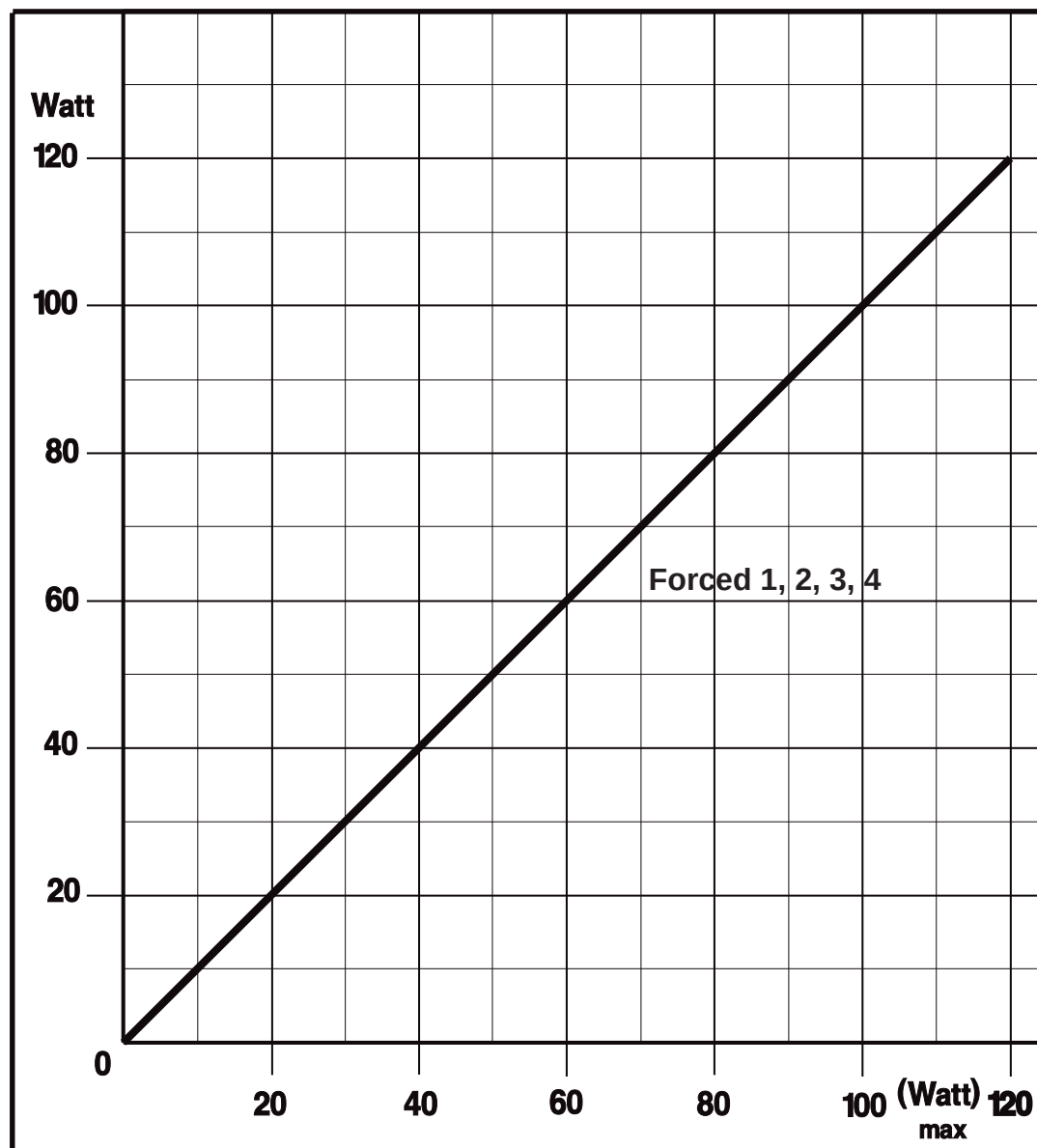
$R_L = 125$ ohms



FORCED COAGULATION

Power output as a function of the power limitation

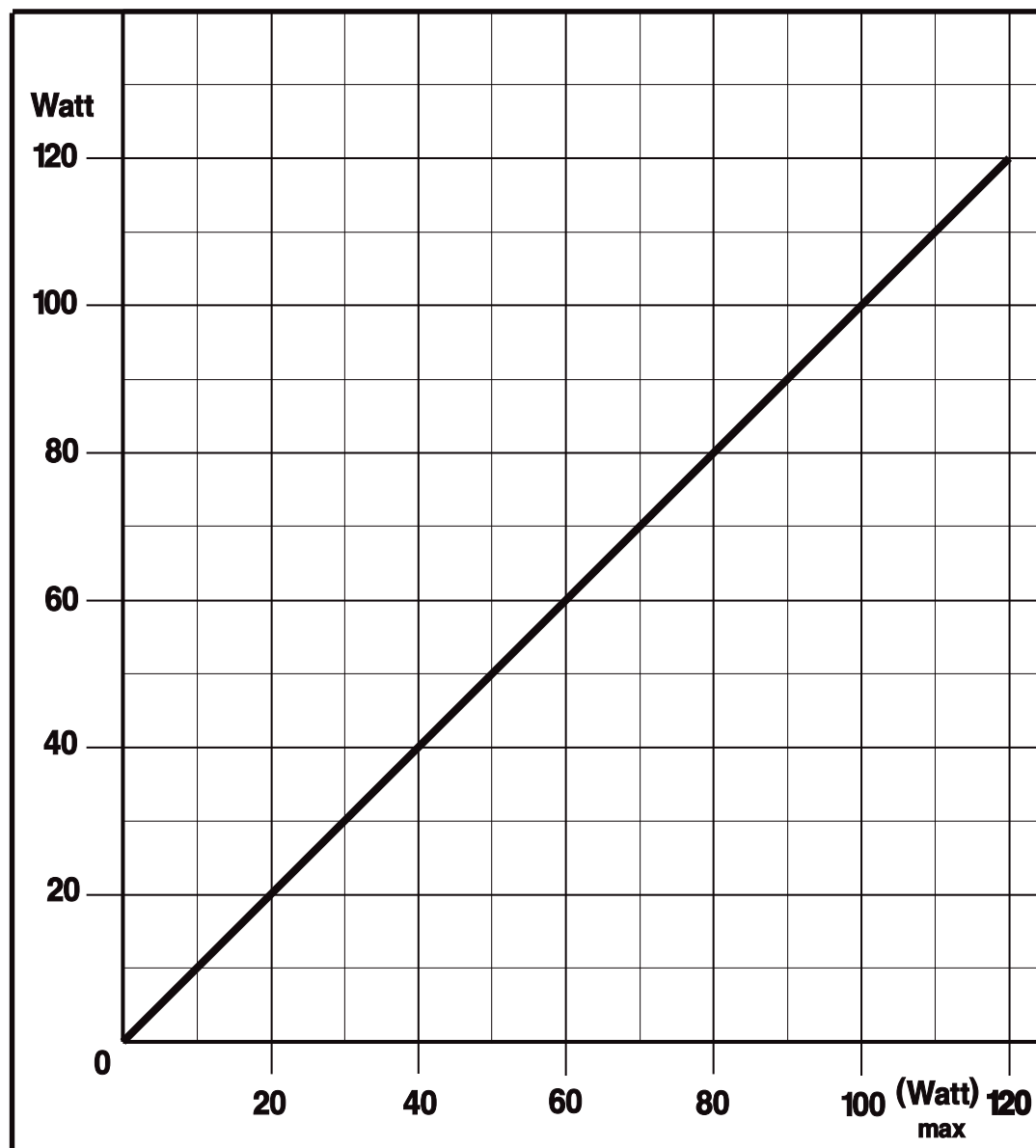
$R_L = 350$ ohms



SPRAY COAGULATION

Power output as a function of the power limitation

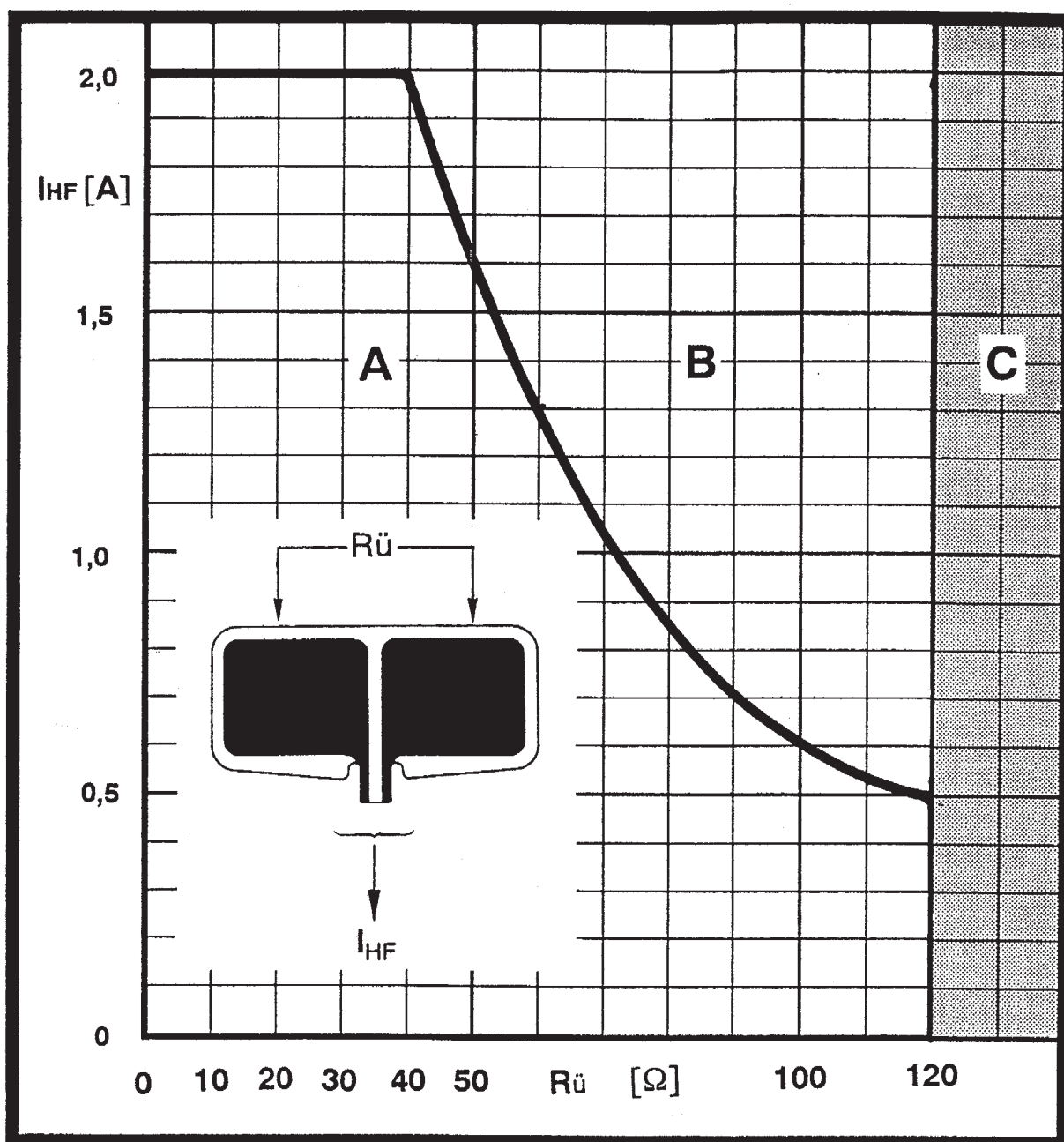
$R_L = 500$ ohms



NESSY

Dependence of the warning signals on contact resistance $R_{\text{ü}}$ between the two contact surfaces of a divided neutral electrode and the HF current I_{HF} flowing through the entire surface of the neutral electrode:

- A = In this range, I_{HF} is sufficiently small relative to $R_{\text{ü}}$. No warning signal.
- B = In this range, I_{HF} is too large relative to $R_{\text{ü}}$. The HF generator can be activated, however a red warning signal and four warning tones are given after each activation of the HF generator. In this condition, the unit must continue to be used only in emergency cases.
- C = In this range, $R_{\text{ü}}$ is greater than 120 ohms. The HF generator cannot be activated. After every activation attempt, a red warning signal and warning tones are given.



10 INSTALLATION

10.1 Spatial requirements

High-frequency surgery units must only be operated in medically used rooms. The spatial requirements, in regard to electric installation, affect e.g. the grounded conductor system, the ground fault interrupt system, as well as measures for preventing electrostatic charges.

The unit is used in rooms in which personnel can pick up electrostatic charges, for example in rooms with electrically nonconductive floors, thus touching the front panel of the units can lead to a brief illumination of light diodes or seven-segment displays due to discharge of an electrostatic charge. However, this occurrence does not change the settings on the front panel.

10.2 Set-up possibilities in the operating room

ICC model series units can be set up in principle on tables, consoles on ceiling suspensions or wall-mounted arms, as well as on special equipment carts.

10.3 Power connection

High-frequency surgical units must only be connected via the power cord provided by the unit manufacturer or one of equal quality equipped with the national test symbol to a correctly installed hospital grade power socket. Here, no outlet power socket or extension cord should be used if possible for reasons of safety. If their use is unavoidable, these must be equipped with a protective ground in perfect working order. The power outlet must be secured with a fuse with at least 10 A rated current.

10.4 Potential equalization

If necessary, the unit can be connected to the potential equalization of the room. This should prevent low-frequency electrode currents, e.g. low-frequency leakage currents in a defective protective ground system, from endangering the patient.

ICC model series units are equipped with a potential equalization connector on the unit back panel according to DIN 42 801. In this way, the units can be connected via a potential equalization line to a potential equalization terminal at the set-up location.

10.5 Explosion protection

High-frequency surgical units intentionally generate electric sparks between an active electrode and tissue. Electric sparks may also result within the unit. For this reason, high-frequency surgical units must not be used in areas where there is a danger of explosion. Considered as explosive is the area up to 20 cm above the floor and the area around and below the operating table, if flammable or explosive cleaning agents, disinfectants, anesthetics, etc. are used. High-frequency surgical units are normally installed outside the zone designated as potentially explosive.



Footswitches are used within the potentially explosive area nevertheless and must therefore be designed as explosion-protected.

10.6 Protection against moisture

ICC model series high-frequency surgical units are protected against the penetration of moisture in accordance with EN 60 601-2-2 . In spite of this, these units should not be set up in the vicinity of hoses or containers which contain liquids. Liquids should not be placed above or even on the unit. Only those footswitches may be used which are watertight in accordance with EN 60 601-2-2 Sec. 44.6 aa. Only those electrode handles with key switches must be used which conform to the EN 60 601-2-2, Sec. 44.6 bb.

10.7 Cooling

ICC model series units must be set up in such a way that free air circulation around their housing is ensured. For that reason, set-up in confined corners, shelves etc. is not permissible.

10.8 HF interferences

High-frequency surgical units intentionally generate high-frequency voltages and currents. It must therefore be taken into consideration during set-up and operation that other electromedical equipment may be subjected to interference in their function.

10.9 Combination with other units

If an ICC is to be operated in combination with other units, make certain that the correct functions and the safety of the units are not impaired by this combination.

For combination of an ICC with an Argon Plasma Coagulation unit, the instruction manual for the Argon Plasma Coagulation must also be precisely observed.

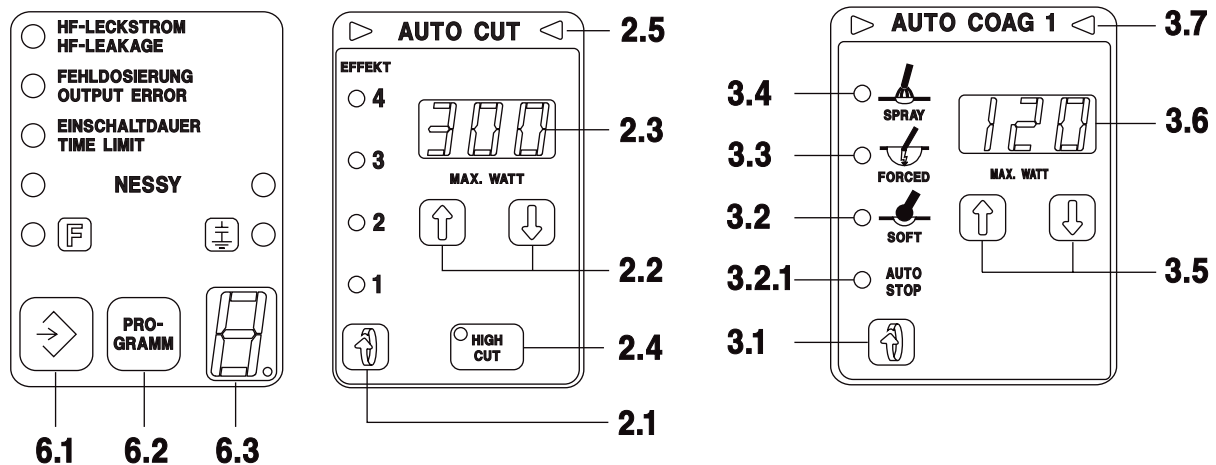
10.10 Receiving inspection

The unit should be checked immediately upon receipt for shipping damage and be subjected to a performance test. In case of damage due to shipping, this must be immediately reported to the shipping agent and a damage report must be filled out to secure the claim for damage compensation. This must include, in addition to the name and address of the recipient, the date of receipt, type and serial number of the unit supplied, as well as a description of the damages.

The unit's original packaging should be retained during the guarantee period so that the unit can be returned in the original packaging if this becomes necessary.

10.11 Custom adaptation of the maximum time limit

In consideration of the risk of thermal tissue damages due to unintentional switching on of an HF high-frequency generator, an unintentionally switched on HF generator should be switched off again as soon as possible automatically. Since the unit cannot automatically distinguish between intentional and unintentional switching on of an HF generator, the automatic switching off of an HF generator must not occur too quickly, because this would impair the operator during cutting and/or coagulation. Since the risk of thermal tissue damage varies greatly among the various operating modes, the units of the ICC model series can adapt and store the maximum time limit for each operating mode and in each storable program via Test program no. 10 of at least 3 sec. to a maximum of 900 sec.



Instructions for custom adaptation of the maximum time limit

1. Call up Test program 10 as follows:
2. Press key 2.1 with the unit switched off and switch on the power.
Pr. = Program appears in Display 2.3
The program number, e.g. 1, appears in Display 3.6.
3. By pressing key 3.5 $\uparrow$, program no. 10 is set and
4. by pressing key 2.1, this program is activated.
The red signal lamp "Time limit" is illuminated and the respective maximum time limit appears in the displays on the function fields.
5. By pressing the $\uparrow$ or $\downarrow$ key beneath the respective display, the maximum time limit for each function field can be adjusted individually from 3 to 900 seconds.
6. By pressing key 6.1, the set maximum time limits are stored. The maximum time limits for all programs, selected by key 6.2, can be set and stored independent of one another.
7. By pressing key 2.1, Test program 10 can be deactivated.
8. It is possible to end the Test mode by switching off the power switch.

WARNING

For safety reasons, a change in the automatic limitation of the maximum time limit must only be made if all users of this unit are informed properly and in good time about this change.

In addition, a change in the automatic limitation of the maximum time limit must be properly documented.

10.12 Versions of Forced coagulation

For Forced coagulation, the ICC produces brief voltage pulses with a high peak voltage. In this way, an efficient hemostasis is achieved even with very small-surface electrodes, such as with TUR resection loops or laparoscopic retractors. However, these voltage pulses can cause more or less intensive disturbances in other electronic equipment, such as in video monitors. The Forced coagulation of the ICC can therefore be adapted via Test program 12 in regard to the maximum adjustable peak value of the voltage pulses according to the respective application purpose. Four different versions of Forced coagulation are available for selection:

Version 1 (Standard version)

In this version, the peak value of the voltage pulses increases as a function of the power limitation in the range from 1 watt to 30 watts continuously to $1,300 V_p$. Above 30 watts power limitation, the peak value of the voltage pulses is limited to a maximum of approx. $1,300 V_p$. This standard version is set and stored on all units in the ICC model series.

Version 2

In this version, the peak value of the voltage pulses continuously increase to $2,300 V_p$ as a function of the power limitation in the range of 1 watt to 80 watts.

Version 3

In this version, the peak value of the voltage pulses increase continuously to $2,300 V_p$ as a function of the power limitation in the range of 1 watt to 30 watts. Above 30 watts power limitation, the peak value of the voltage pulses is limited to a maximum of approx. $2,300 V_p$.

Version 4 (not ICC 350 T, Z)

In this version, the peak value of the voltage pulses increase continuously to $2,600 V_p$ as a function of the power limitation in the range of 1 watt to 30 watts. Above 30 watts power limitation, the peak value of the voltage pulses is limited to a maximum of approx. $2,600 V_p$.



The currently selected version of Forced coagulation applies to the AUTO COAG 1 function field, AUTO COAG 2 function field and to the programs. The selected version of Forced coagulation can be stored. If Version 2, 3 or 4 is stored, the unit briefly displays the current version every time after the power switch is switched on. Standard version 1 is not displayed.

In addition, any change of the version of Forced coagulation must be properly documented.

10.13 Versions of neutral electrode switching

The ICC neutral electrode can be operated either as capacitively grounded or insulated to ground potential. The currently selected operating mode is displayed on the front panel. The operating mode can be switched over by the Technical Service.

11 CLEANING AND DISINFECTION OF THE UNIT

11.1 Cleaning and disinfection of the unit

The unit housing should only be cleaned and disinfected with nonflammable and nonexplosive agents. Make certain here that no moisture penetrates into the unit.

We recommend a spray or wipe-down disinfection. However, the information from the disinfectant manufacturer absolutely must be observed here.

WARNING

If cleaning or disinfection of the unit with flammable or explosive agents unavoidable, this must be completely evaporated from the unit before switching on the unit.

Use no alcohol or disinfectant products with an alcohol base. The surface coating on the front plate may become detached.

12 PERFORMANCE CHECKS

Before every application, the user should check the functional efficiency of the unit and the accessories. The ICC is equipped for this with various automatic performance checks that, each time the power switch is switched on, proceed briefly and thus signal and display recognized errors. However, not all possible errors are automatically detected and displayed.

12.1 Automatic performance test after switching on the unit

Each time after switching on, the unit goes through an automatic performance check. If performance errors are detected here, these errors are signaled acoustically and an error number assigned to the respective error is displayed. The following performance errors of the unit and of accessories connected to the unit can be automatically recognized:

1. If a key on the front panel is depressed or shorted out due to an error once the power switch is switched on, this error is signaled acoustically after switching on the power switch and displayed by an error number.
2. If a key on the electrode handle is shorted out or bypassed at low resistance (e.g. due to moisture in the electrode handle) due to an error or depressed while the power switch is switched on, this error is signaled acoustically after the power switch is switched on and displayed by an error number.
3. If the contact of a footswitch is shorted out due to an error or if a pedal is stuck or a pedal is pushed while the power switch is switched on, this error is signaled acoustically and displayed by an error number.

12.2 Automatic performance check during activation

After every activation, the unit goes through an automatic performance check. If performance errors are determined here, these errors are acoustically signaled and an error number assigned to the respective error is displayed. The following performance errors of the unit and before accessories connected to the unit are automatically recognized:

12.2.1 Check of the HF output voltage

If the HF output voltage deviates from the set HF output voltage when activating a certain operating mode, e.g. CUTTING or SOFT COAGULATION, the unit produces visual and acoustic warning signals.

12.2.2 Automatic check of the neutral electrode

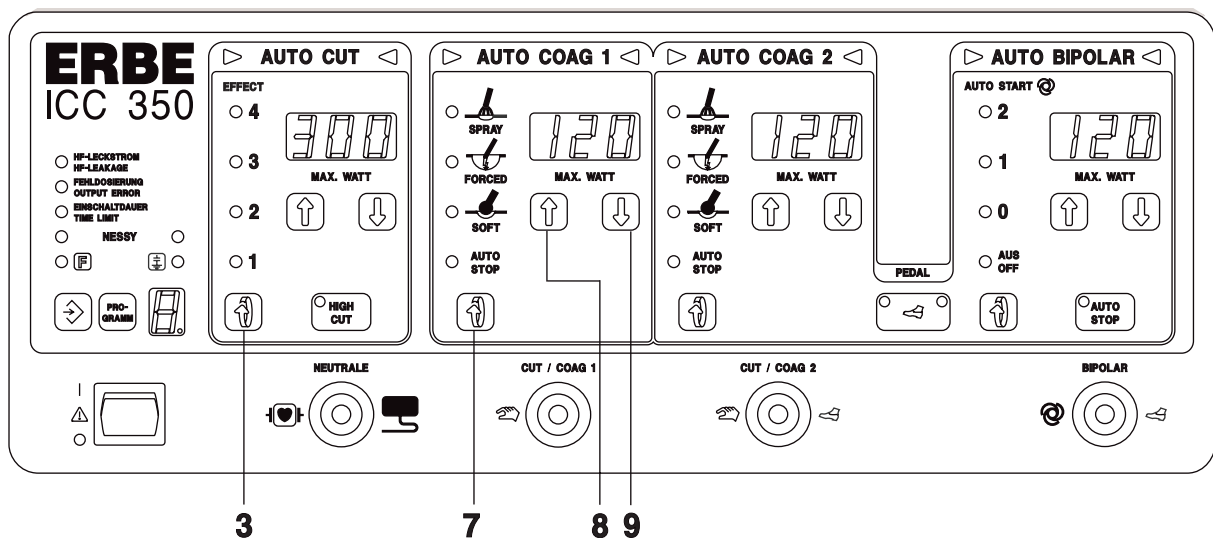
If during activation, the connection to the neutral electrode is interrupted, or if the contact resistance (only for a divided neutral electrode) is too high, the unit switches the HF generator off, produces an acoustic warning signal and displays the error by an error number.

12.3 Automatic error documentation

The ICC is equipped with an automatic error recognition, error signaling and error documentation device. Errors are recorded which are present or occur during the switching on of the power switch, during the Self Check after switching on the power switch, during tests or during activation of the unit and/or of accessories connected to the unit. The smaller errors recognized by the unit are only signaled visually, larger errors are signaled visually and also acoustically. The various errors recognized by the unit are assigned error numbers. If an error occurs, it is not only immediately signaled visually and/or acoustically, but also the corresponding error number is stored in the unit, where it then also remains stored once the unit has been switched off. The last 10 error numbers can be called up as follows via Test program number 2 at any time.

Calling up the stored error numbers via Test program 2:

- a) Press key 3 while the unit is switched off and switch on the power switch.
 - Pr (Program) appears in the AUTO CUT display
 - 1 appears in the AUTO COAG 1 display
- b) Select program no. 2 by pressing key 8
 - 2 appears in the AUTO COAG 1 display.
- c) Test program no. 2 is activated by pressing key 3.
 - Err (Error) appears in the AUTO CUT display.
 - 1 (error memory location no. 1) appears in the AUTO COAG 1 display.
 - The error number stored at error memory location 1 appears in the AUTO BIPOLAR display.
- d) In the error list, the various errors for the error numbers are described.
- e) By pressing keys 8 or 9, the 10 error memory locations available can be called up.
 - The number of the current error memory location appears in the AUTO COAG 1 display.
 - The current error number appears in the AUTO BIPOLAR display.
- f) By pressing key 7, the error numbers on all error memory locations can be deleted.



Error list		
Error No.	Error	How to proceed?
0	No error	
1	No HF output voltage	Notify the Technical Service
2	HF output voltage too high	Notify the Technical Service
3	No HF output voltage	Notify the Technical Service
4	HF output voltage too high	Notify the Technical Service
5	LF leakage current greater than 0.05 mA	Notify the Technical Service
6	Activation error	Notify the Technical Service
7	Activation error	Notify the Technical Service
9	Time limit exceeded	Heed maximum time limit
10	Erroneous setting of the AUTO CUT function field during activation	Before activation of a cutting mode, the AUTO CUT function field must be completely set
11	Erroneous setting of the AUTO COAG 1 or AUTO COAG 2 function field during activation	Before activation, the AUTO COAG 1 or AUTO COAG 2 function field must be completely set
12	Erroneous setting of the AUTO BIPOLAR function field during activation	Before activation, the AUTO BIPOLAR function field must be completely set
13	The contact surface between the neutral electrode and the patient is too small or the neutral electrode was not connected to the unit. This error is recognized and reported in the Standby mode or during activation of the unit. Only for NESSY Version 2 Error in the connection between the neutral electrode and unit Only for NESSY Version 3 Short between the two contact surfaces of a divided neutral electrode or in the cable to the neutral electrode	Use a sufficiently large neutral electrode and apply to the entire surface. Check the connection of the neutral electrode to the unit. Check the connection between the neutral electrode and unit. Probably a faulty cable or faulty plug Eliminate short or exchange cable
17	HF leakage current greater than 300 mA	Check whether the neutral electrode was correctly applied and make certain that the patient has no contact with electrically conductive objects.
18	HF leakage current greater than 150 mA	Check whether the neutral electrode was correctly applied and make certain that the patient has no contact with electrically conductive objects.
19	The contact surface between the neutral electrode and the patient was too small	Use a sufficiently large neutral electrode and apply to the entire surface.
20	The neutral electrode was applied in the incorrect direction	See Chapter 4.4.5 NESSY
21	The neutral electrode was applied in the incorrect direction	See Chapter 4.4.5 NESSY
22	When switching on the power switch, the yellow pedal on the footswitch or the yellow key on the electrode handle was already pressed	Check whether there was an operating error or whether the yellow pedal of the footswitch or the yellow key on the electrode handle is defective

23	When switching on the power switch, the blue pedal on the footswitch or the blue key on the electrode handle was already pressed for CUT/COAG 1	Check whether there was an operating error or whether the blue key on the electrode handle or the cable to the electrode handle is defective
24	When switching on the power switch, the blue pedal on the footswitch or the blue key on the electrode handle was already pressed for CUT/COAG 2	Check whether there was an operating error or whether the blue pedal is defective
25	When switching on the power switch, the blue pedal on the dual-pedal footswitch or the white pedal on the single-pedal footswitch was already pressed	Check whether there was an operating error or whether the blue pedal of the dual-pedal footswitch or the white pedal of the single-pedal footswitch is defective
26	When switching on the power switch, there was already an electrically conductive connection between the two poles of the bipolar instrument	Always make certain that bipolar or monopolar active electrodes or instruments are laid down on electrically nonconductive surfaces
27	The internal temperature of the unit was too high. The maximum HF power was automatically reduced.	Always set up the unit in such a way that air can reach the housing. If this error number appears, the unit may continue to be used if the reduced power is sufficient for the respective operation
28 to 29	These errors concern functions in the unit	Please notify the Technical Service
30	The load resistance of the unit was too low	Either the contact surface of the active electrode was too large or the power limitation set too low, or there was contact between an active electrode and a metallic instrument, e.g. trocar sheath.
31	The HF generator of the unit was overloaded too long. The maximum power output was automatically reduced.	The unit can briefly supply more than 300 watts power. More than 400 watts, averaged over 1 second, are not permitted for reasons of safety.
32 to 35	These errors affect functions in the unit	Please notify the Technical Service
36	The Auto Start key was pressed while the coagulation electrode was already touching the tissue	Always first set the required activation mode and then apply the coagulation electrode to the tissue to be coagulated
37	This error concerns functions in the unit	Please notify the Technical Service
38	Short between the two poles of a bipolar instrument, i.e. a bipolar forceps	Avoid shorts
40 to 49	This error concerns functions in the unit	Please notify the Technical Service
50 to 51	Error in a front panel key	Please notify the Technical Service
71 to 76	These errors concern the serial interface on units that are equipped with a serial interface	Please notify the Technical Service
80 to 91	These errors concern units with built-in Neurotest	
81	Technical error in the intensity setting	Please notify the Technical Service
82	Neutral electrode missing or too small	Check neutral electrode
83	Pulse current somewhat too high, however still within the tolerance limits	
84	Pulse current too high	Please notify the Technical Service

85	No pulse current	Check whether there was an interruption in the connecting cables or whether the active or neutral electrode was not applied
86	No pulse current	Check whether there was an interruption in the connecting cables or whether the active or neutral electrode was not applied. If neither of these errors was found, then please contact the Technical Service
87	Pulse current too low, however still within tolerance limits	
88	Maximum time limit exceeded	Reactivate if necessary
89	The Neurotest is already activated when the unit is switched on	Always switch on unit and activate after the automatic self check and confirmation of the front panel setting
90	Electronic fuse for prevention of unpermissibly high currents is triggered	Please notify the Technical Service
91	Technical error	Please notify the Technical Service
CAUTION This error list contains error descriptions relevant only to the operator. Errors that concern the Technical Service are described in the technical service documentation.		

13 SAFETY CHECKS

To prevent a reduction in safety for the unit due to age, wear etc., § 6 of the regulation concerning the installation, operation and use of active medical products (BetreibVaMP) prescribes regular safety checks. The operator must have the safety checks which have been established for this unit properly performed to the prescribed extent. The safety checks must only be done by the manufacturer or by persons expressly authorized by him.

The following safety checks have been established for the ICC :

- Inspection of inscriptions and instruction manual
- Visual inspection of the unit and accessories for damage
- Inspection for electrical safety according to EN 60 601-1, Part 1
 - a) Grounded conductor inspection
 - b) Leakage current inspection
- Performance test of all switches and control lamps on the unit
- Inspection of the monitoring devices
- Inspection of the automatic start mode
- Measurement of power output in the CUT operating mode.
- Measurement of power output in the COAGULATE operating mode.
- Measurement of the high-frequency capacities in the various operating modes
- The high-frequency surgical unit must undergo a safety check at least once a year.

The results of these safety checks must be entered in the medical product logbook.

If deficiencies are found during the safety checks, by which patients, employees or third parties could be endangered, the unit must not be operated until these deficiencies have been rectified by a professional technical service.

14 MAINTENANCE, CARE AND DISPOSAL OF THE UNIT

14.1 Maintenance of the unit including reusable accessories

Maintenance of the unit including the reusable accessories includes preventive and corrective measures for servicing. Therefore established, regularly performed safety checks (see Chapter 9) represent preventive measures, while changes and repairs can be summarized under the category of corrective maintenance. Through regular maintenance, the unit including the reusable accessories should be kept within the required status specified in the technical data, and operational readiness and safety are guaranteed for this until the next maintenance date.

14.1.1 Changes and repairs

Changes and repairs must not reduce the safety of the unit and its accessories for the patient, the user and the surroundings. This is considered fulfilled if structural and functional features have not been changed at the expense of safety (DIN 57 751-1/VDE 0751-1). Changes and repairs to the unit, in consideration of the special safety requirements for high-frequency surgical units, must only be performed by the manufacturer or by persons expressly authorized to do this by him. If unauthorized persons perform improper changes or repairs to the unit or accessories, the manufacturer assumes no liability. Additionally in this case, the guarantee claim becomes void.

14.2 Care of the unit

Effective protection of the unit from damage also includes, in addition to proper operation and maintenance, the safe set-up of the unit. This also includes, in addition to safe fixation of the unit to its base, its protection from moisture, contamination and contact with flammable or explosive substances. To ensure good radiation of unit heat resulting from operation, air circulation around the cooling fans and the heat sink must not be impeded.

14.3 Disposal of the unit

The unit can be disposed of at the end of its useful life as standard electronic scrap.

15 CONDITIONS OF GUARANTEE

15.1 Customer service

If you are interested in a service contract, please contact ERBE Elektromedizin or an authorized retailer. Do you have questions regarding high-frequency surgery, the ICC or on this instruction manual? Wish you like the latest scientific publications on high-frequency surgery? Please contact an ERBE employee or your local branch office. We would be glad to help you.

15.2 Conditions of guarantee

The unit and accessories must be immediately examined upon receipt for defects and shipping damage. Claims for damage compensation in this regard are only considered valid if the Seller or Shipping agent is immediately notified. A damage report must be filled out.

The term of guarantee for the ICC is 1 year, for accessory parts 6 months, calculated from the date of delivery. A claim of guarantee can only be made when the properly completed guarantee certificate is presented.

The scope of the guarantee encompasses no-cost repair of the unit, provided the damage was caused by a material or manufacturing error. Other claims, particularly claims of damage compensation, are excluded.

Repair must only be performed by ERBE, one of our representatives, or by an authorized retailer. The claim of guarantee becomes void if improper changes or repairs were made.

Through guarantee performances, the guarantee is neither extended nor renewed.

