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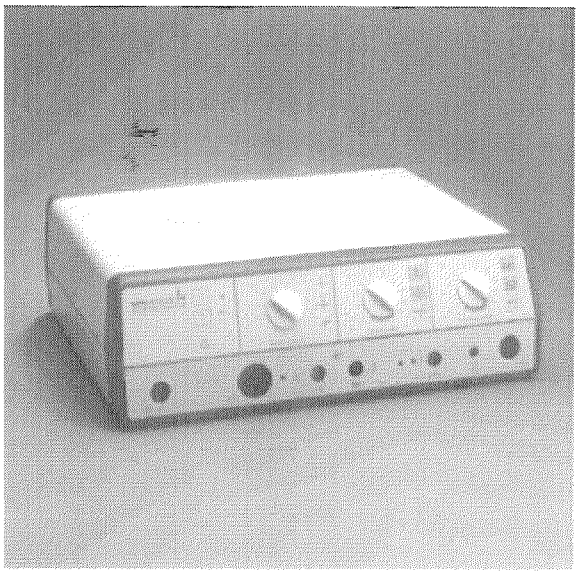
BERCHTOLD



ELEKTROTOM® 530

Service Manual (E)

Valid for version 11.10 – 11.24

1. General

1.1 Manufacturer's notes

The manufacturer of the products specified in the user's manual is

BERCHTOLD GmbH & Co
Medizin-Elektronik
Ludwigstaler Straße 25
Postfach 4052
D-78505 Tuttlingen
Internet: http://www.Berchtold.de
e-mail: Berchtold.Medizinelektronik@Berchtold.de
Tel. (+49) 7461 / 181-0
Fax (+49) 7461 / 181-200
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1.2 General information

- This user's manual is considered part of the equipment. It must be kept in the vicinity of the equipment at all times. Precise observance of the user's manual is a prerequisite for the proper use and correct operation of the equipment, which is essential for the safety of patients and operators alike.
- Only accessories which are specified in this user's manual and which have been tested together with the equipment may be used. If accessories are used which are not specified in the user's manual, their ability to be used in accordance with safety regulations must be proved.
-

1.3 Notes on product responsibility

The BERCHTOLD company can only consider themselves responsible for the safety, reliability and function of the product under the following conditions:

a) installation, modifications or repairs have been performed only by BERCHTOLD or by an agent expressly authorized by BERCHTOLD to do so,

b) the electrical installation of the room complies with regulations VDE 0107 or IEC 364-710,

c) the product is used in accordance with the operating instructions.

1.4 Routine checks following delivery

The product and accessories should be inspected for possible transport damage or other defects immediately on arrival.

Reclamation regarding damage or defects can only be entertained by the selling organisation (BERCHTOLD GmbH & Co.) or the delivering agency when they are immediately reported. In case of complaint, the forwarding agent or the BERCHTOLD sub-agency must immediately be informed, prior to the submission of a damage / deficiency report to the BERCHTOLD main offices in Germany for further processing by our insurance agents.

When returning a unit or one of its components to BERCHTOLD or to a BERCHTOLD service centre, every effort should be made to use the original packaging material. The following information/documentation must also accompany the returned items: Name and address of the owners, product identification number (See plate affixed to unit), Detailed description of the defect.

1.5 Guarantee

The product is guaranteed for a period of twelve months starting from the day of delivery to the end user. Within the guarantee period, all defects or components shown to be due to manufacturing or material failure, will be cor-rected by either BERCHTOLD or their official, representative agency.

Misuse of the unit or interference from a third party will negate any customer entitlement under this guarantee.

Please note the contents of the guarantee card and retain it for future reference.

Important!
Repairs or adjustments must only be made by BERCHTOLD or their specifically nominated representative. Should repairs or adjustments be made by a specifically nominated BERCHTOLD representative, the user is required to obtain a detailed report from that agent showing the kind and extent of repairs carried out. This report should further show the date of any intervention and an approved signature of the company (agency) who undertook the work. Where repairs are not carried out directly by BERCHTOLD, repaired systems or system parts must bear the mark or indicator of the repairing agent.

1.6 EC certification

The equipment complies with the requirements of the EC guideline regarding medical products, 93/42/EEC.

1.7 Repairs

By obvious defect, either of the unit or its connecting cable, it must be repaired or its cable renewed

before being used again.

The ELEKTROTOM® 530 may only be repaired by BERCHTOLD or their officially appointed agent.

Should the unit be repaired by an officially appointed agent, the user is required to obtain written confirmation of the work carried out. This signed confirmation should bare the date of the repair and the details of the officially appointed agent. When repairs are not carried out by BERCHTOLD direct, the repairing organisation must append their details to the unit or, that part of the unit which has been repaired.

1.7.1 Replacement of fuses

- Remove mains cable from the connection socket (38).
- The unit fuses are located in the plug-in module (37) at the back of the unit (see page 5). The fuse module can be removed by squeezing the sides. The fuse value (at 230 V - T 2.5 A) given on the fuse carrier must be observed at all times.
- Replace the fuse carrier and connect the mains cable to the socket (38).

1.8 Technical safety controls

The following controls must be carried out at least on a yearly basis:

- Visual checking for any mechanical or functional defect
- Safety relevant markings on the unit must be readable
- Checking of the mains fuses against nominal electrical value
- Checking the calibration of the HF current output against the setting of the pressure sensitive pad of the control panel
- The actual output measurement for the current modes cut I, spray and softcoagulation should be checked to the values the laid down in the specifications for the unit.
- Checking of optical and acoustic signalisation
- Compare protected resistance according to EN 60601-1 with mains connection. Limit is 0,2 Ω
- Measure leak values to earth. According to EN 60601-1 — Limit 0,50 mA (N.C.) * / Limit 1,00 mA (S.F.C.) **
- Measure case leakage according to EN 60601-1 — Limit 0,10 mA (N.C.) * / Limit 0,50 mA (S.F.C.) **
- Measure patient leakage according to EN 60601-1 — Limit 0,01 mA (N.C.) * / Limit 0,05 mA (S.F.C.) **
- Measure patient leakage according to EN 60601-1 (Mains voltage at used instrument) — Limit 0,05 mA (S.F.C.) **

* N.C. = Normal condition
** S.F.C. = Single fault condition

The results of the technical safety checks should be documented.

Should the unit proofe to be defective or otherwise unsafe it must not be used until repaired.

2. Commissioning

2.1 Installation

The unit is intended for use only in a medical environment and connection to the mains must be in accordance with the IEC 364-710 regulations. Further, connection to the mains should be via a suitably protected socket using the mains lead and plug provided by the manufacturer or one of an equivalent quality. For safety reasons, extension leads or multi-socket connections should not be used. The mains socket must be protected by a fuse rated at not less than 10 Amperes.

The ELEKTROTOM® can be placed on any flat surface with a tilt angle not in excess of 10°. The surface itself should be equivalent in size to that of the unit. Care must be taken not to block the air vents on the underside of the generator and ensure a free flow of air around the unit. The ELEKTROTOM® should be protected from the danger of fluids entering the unit.

For intracardiac surgery this equipment must be connected to the main power stabilizer in the operating room or location where it is installed by means of the (yellow/green) power-stabilization cable supplied.

2.2 Important notes for safe usage

Misuse of the generator and a disregard of these instruction can lead to serious injury!

Take care to study these instructions supplied with your ELEKTROTOM®

Warning!
The unit is not intended for use in explosion endangered areas.

Caution must be exercised when anaesthetic gas mixtures such as Oxygen (O_2) and nitrous Oxide (N_2O) are used during surgery in the thoracic or head regions. The use of anaesthetic gas, exhaust management systems is to be recommended. Inflammable substances used for cleaning or disinfection or, particularly, solvents used to remove adhesives, must be removed or fully evaporated before the using an electrosurgical unit. The danger of pocketing or pooling of inflammable liquids or vapours in body cavities such as the navel or vagina as well as in the depths of surgical wounds which must also be considered and not underestimated. Liquids must not be allowed to gather or pool under the patient. The presence of endogenic gases which may be ignited, must also be taken into account when using electrosurgical equipment on the gut and a system of inert gas flushing is recommended. Material such as cotton wool or gauze can, in certain circumstances, also be ignited via HF current induced sparking - particularly in the presence of oxygen.

The use of electrosurgery requires caution and the following rules should be considered

- The high frequency current output of the unit should be minimal and not more than is required for the task to be performed.

Note:
A reduced or lack of function after setting the unit output controls at 'normal' power can be caused by a number of factors such as neutral electrode problems, bad connections, damaged cables or a crusted active electrode. Theses point should be considered before selecting what might be a much higher unit output than necessary.

- Do not attempt to test the unit by directly discharging against a metal object or the negative electrode.
- The function of other electromedical equipment can be interfered with by the use of high frequency current.
- The switching mechanisms of an electrode handle which is not completely water tight, may be penetrated by blood, saline or other rinsing liquids or amniotic fluid producing an unpredictable response from the generator.
- In order to prevent accidental HF current burns, the electrode handle should be placed on the instrument trolley when not in use and not on the patient.
- Placing a finger switched, electrode handle onto very damp drapes or, into pooled liquid on the drapes, may cause patient burns directly below the electrode handle.

2.3 First usage

Before the unit is first used surgically, the Manufacturer or their official agent shall:

a) have fully tested the unit in the position in which it is to be used;

b) have given full operational instructions for the unit to a responsible person.

2.4 Visual and functional checks before each use

Before each use the user must be sure that the unit and its accessories are in good working order.

The following visual checks should be made:

- check for external damage to the unit, insulation and plugs
- check that the appropriate accessories a present and that they fit
- Very carefully check the insulation on endoscopic instruments

Damaged or doubtful equipment must not be used.

Warning!
Should the flow of HF current be indicated by the unit without the attachment of a foot-switch or electrode handle with a double, finger switch then the unit is faulty and must be examined before use. An indicated malfunction following the attachment of a foot-switch or electrode handle with double, finger switch shows a defective accessory which must be checked and eventually replaced.

2.5 Cleaning, disinfecting and sterilisation

2.5.1 Cleaning and disinfecting of the unit

The entire exterior of the unit, including the foil covered operating panel, can be cleaned with normal, alcohol free cleaning fluids. (Spray or wipe disinfecting)

Please take note of the manufacturers instructions for disinfectant solutions.

2.5.2 Cleaning, disinfecting and sterilisation of accessories

After use, accessories may be soaked in standard disinfecting solutions following the instructions of the manufacturers, without exceeding soaking times. The life expectancy of some plastics may be shortened by certain chemicals and a thorough rinsing of all accessories is important. Phenol and chlorine solutions are not suitable. Alternatively, a mechanised washing and thermal disinfecting process is acceptable, provided temperatures do not exceed 93° C.

Good operative results can only be expected when the active and negative electrode are perfectly clean and free from any dried protein.

Connecting cables and the insulation of active electrodes must be constantly checked and maintained in perfect condition. Articles with damaged insulation must not be used.

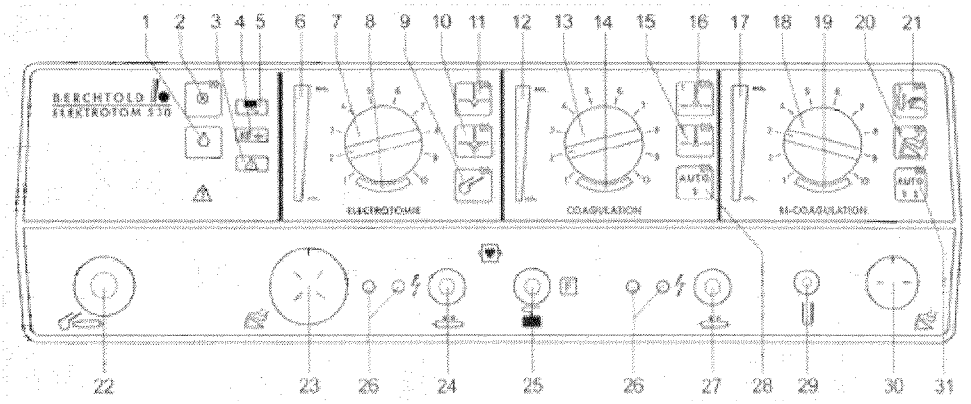
The following sterilisation temperatures are acceptable:

	Gas sterilisation up to 70 °C	Gas sterilisation up to 70 °C	Hot air sterilisation at 200 ° C
Connecting cables for electrode handle	yes	yes	no
Electrode handle	yes	yes	no
Active electrodes	yes	yes	yes
Bipolar coagulation forceps	yes	yes	no
Neutral electrode of conductive silicon rubber	yes	yes	no

3. Operating the ELEKTROTOM® 530

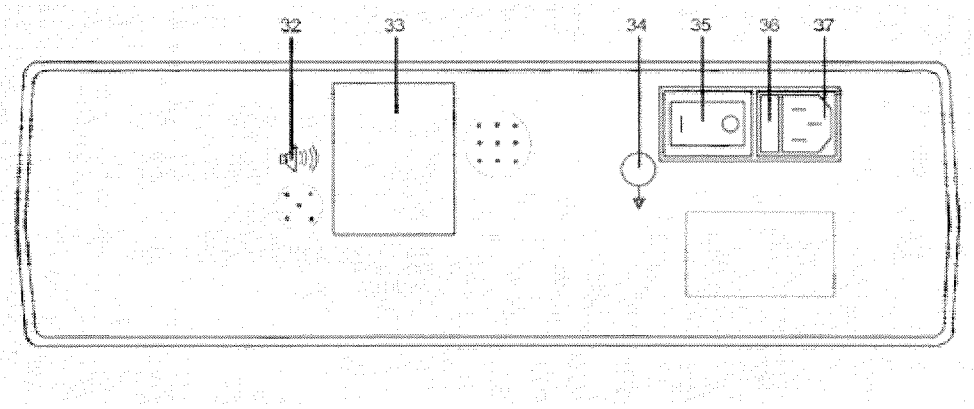
3.1 Pushbuttons and signal lights

3.1.1 The front of the ELEKTROTOM® 530



1 Unit STANDBY OFF-switch
2 Unit STANDBY ON-switch
3 Indicator lamp for incorrect output
4 Indicator lamp HF leakage current monitoring and for
Version 11.20 and 11.24 also a indication for overheating of the generator
5 Indicator lamp neutral electrode monitoring
6 Light bar indicator for the CUT power
7 Output control - CUT
8 Indicator lamp CUT
9 Selection switch TUR
10 Selection switch Cut II
11 Selection switch Cut I
12 Light bar indicator for the COAGULATION power
13 Output control COAGULATION
14 Indicator lamp COAGULATION
15 Selection switch CONTACT COAGULATION
16 Selection switch SPRAY COAGULATION
17 Light bar indicator for BI-COAGULATION power
18 Output control BI-COAGULATIN
19 Indicator lamp BI-COAGULATION
20 Selection switch for foot switch start BI-COAGULATION
(with our without Auto- Stop-Mode)
21 Selection switch for automatic start BI-COAGULATION
(with our without Auto- Stop-Mode)
22 Socket for active electrode with 8 mm banana plug
23 Socket for double pedal foot switch to control active electrode 1
24 Socket for active electrode 1
25 Socket for neutral electrode (single or split neutral electrode)
26 Additional sockets for disposable hand pieces
27 Socket for active electrode 2
28 Selection switch Contact Coagulation with Auto-Stop
29 Socket for bipolar coagulation instruments
30 Socket for single foot switch (Bi-coagulation)
31 Selection switch bipolar coagulation with Auto-Stop-Mode

3.1.2 Rear panel of ELEKTROTOM® 530



32 Symbol for acoustic signal (volume not adjustable)
33 Rating plate with serial no. and indication of voltage
34 Equipotential cable connector
35 Mains switch
36 Mains fuses in fuse holder
37 Connection socket for mains cable

3.1.3 Description of the pictograms

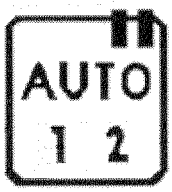
Socket for hand piece with double finger switch for activating cut or coagulation

Socket for foot switch, for both double pedal foot switch (monopolar) and single foot switch (bipolar)

Socket for neutral electrode cable, single or split neutral electrode

Selection switch for Bipolar coagulation ,automatic start with or without Auto-Stop. When the switch is illuminated current will automatically be switched on for Bi-coagulation 2 seconds after the forceps grasp the tissue and when Auto-Stop is selected, automatically switched off after coagulation. The Auto-Stop-Mode can be switched on and off by means of the "Auto" switch.

Selection switch for Bipolar coagulation using a foot switch. Foot switch start with or without Auto-Stop. The Auto-Stop-Mode can be switched on and off by means of the "Auto" switch.



Selection switch for Auto-Stop-Mode of the coagulation method selected or Start-switch with no. 1 or 2. When the switch is illuminated current will automatically be switched off after coagulation

Socket for Bipolar coagulation instruments.

Floating output - the neutral electrode is isolated from earth at both high and low frequencies

Type CF equipment. This unit provides a high degree of protection against electric shock, especially with reference to permitted low frequency leakage current. Therefore this unit is suitable for direct cardiac application.

Notice: ATTENTION! Please refer to the operator's manual

ATTENTION! High voltage, voltages of > 1000 V may be present at this socket.

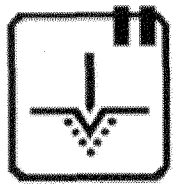
3.1.4 Types of output

The unit produces unmodulated or selectively modulated High Frequency current. The selection switches permit a choice of the following current types:

CUT I

Unmodulated RF current.

This current type gives sharp cutting with little arc formation and without coagulation of the cut surfaces.



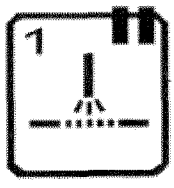
CUT II

Lightly modulated RF current. This current type gives a clean cut with some coagulation of the cut surfaces

TUR (Transurethral resection)

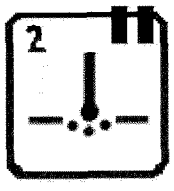
Unmodulated RF current.

This current type offers optimum parameters for endoscopic resections in the areas of Urology (TUR), Arthroscopy or using rinsing fluids.



SPRAY COAGULATION

Highly modulated RF current with high initial voltage peak for spray coagulation or fulguration



CONTACT COAGULATION

with or without Auto-Stop

Lightly modulated RF current for contact coagulation using ball or plate electrodes, or artery clamps. The Auto-Stop Mode is engaged when its switch is illuminated and when Auto-Stop is selected, current is automatically switched off after coagulation.

4. Technical description

4.1 Technical description to Version 11.23

4.1.1 Technical data

4.1.1.1 Mains connection

Mains voltage	110-120 / 220-240 V alternate current ± 10 % (See marking at the rear of the unit)
Nominal frequency	50/60 Hz
Power consumption	750 VA
Loading relationship	int. 10s/30s (Time relation: active / pause)
Mains fuses	2 each 2,5 A (inert) according to rating plate

4.1.1.2 HF current output and current characteristics

Cutting current

• CUT I

Nominal frequency	500 kHz
Current form	non modulated, sinus form
Crest factor	1,5
Max. HF no-load voltage	1500 peak to peak /500 V effective
Max. HF power	350 W/250 Ω
Unit output settings	10 position switch
Cutting qualities	minimal charring

• Cut II

Nominal frequency	500 kHz
Current form	modulated, sinus form
Crest factor	2,1
Max. HF no-load voltage	2000 peak to peak /470 V effective
Max. HF power	300 W/250 Ω
Unit output settings	10 position switch
Cutting qualities	medium charring

• Resection – transurethral or arthroscopic resection with flushing solution

Nominal frequency	500 kHz
Current form	non modulated, sinus form
Crest factor	1,5
Max. HF no-load voltage	2000 peak to peak /730 V effective
Max. HF power	300 W/700 Ω
Unit output settings	10 position switch
Cutting qualities	medium charring

• Spray coagulation (fulguration)

Nominal frequency	500 kHz
Current form	impulse modulated, sinus form
Crest factor	3,2
Max. HF no-load voltage	4900 peak to peak /770 V effective
Max. HF power	100 W/940 Ω
Unit output settings	10 position switch
Cutting qualities	non-contact, micro-arc, with limited surface charring and minimal depth penetration

• Contact coagulation

Nominal frequency	500 kHz
Current form	impulse modulated, sinus form
Crest factor	2,4
Max. HF no-load voltage	2300 peak to peak /470 V effective
Max. HF power	250 W/250 Ω
Unit output settings	10 position switch
Cutting qualities	micro-arc controlled, with limited surface carbonisation; partial electrode sticking is unavoidable

• Bipolar coagulation

Nominal frequency	500 kHz
Current form	non modulated, sinus form
Crest factor	1,4
Max. HF no-load voltage	310 peak to peak /110 V effective
Max. HF power	100 W/50 Ω
Unit output settings	10 position switch
Cutting qualities	micro-arc free coagulation without tissue carbonisation, with anti-sticking effect

4.1.1.3 Safety relevant data

Basic construction in accordance with	EN 60601-1
Protection class	I
Unit type	cardiac floating (CF)
Switching of neutral electrode	floating output
Neutral electrode monitoring	• continuous electronic control of neutral electrode cable • continuous electronic control of contact impedance with patient contact control, split neutral electrodes
Dosage shut-off due to unit malfunction	
Timed active mode	automatic
Anti-malfunction control	acoustic signal after 10 seconds
HF. leakage control	self-check on switching on
Equipotential bonding	automatic reduction in HF if the limit value is exceeded Connector plug

4.1.1.4 Dimensions and weight

Length x width x height = 400 x 380 x 130 mm

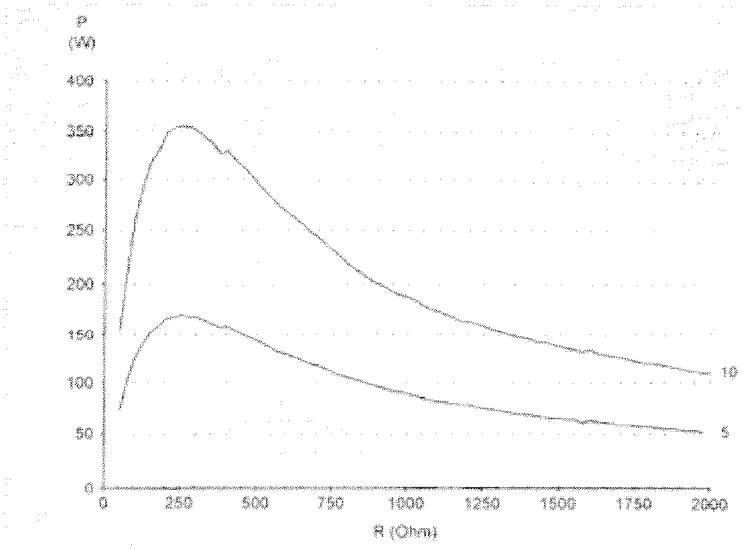
Weight: 9,5 kg

4.1.1.5 Certification CE 0125 conform with 93/42/EEC

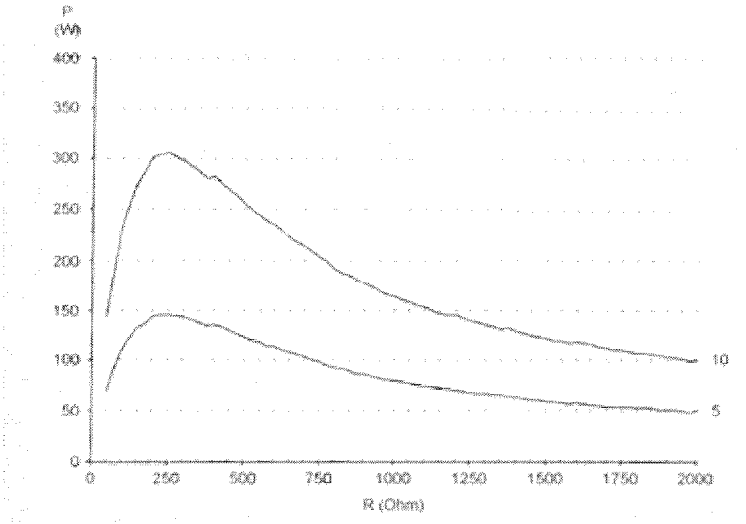
4.2 Power output diagram

4.2.1 Power output in relation to resistance (output characteristic)

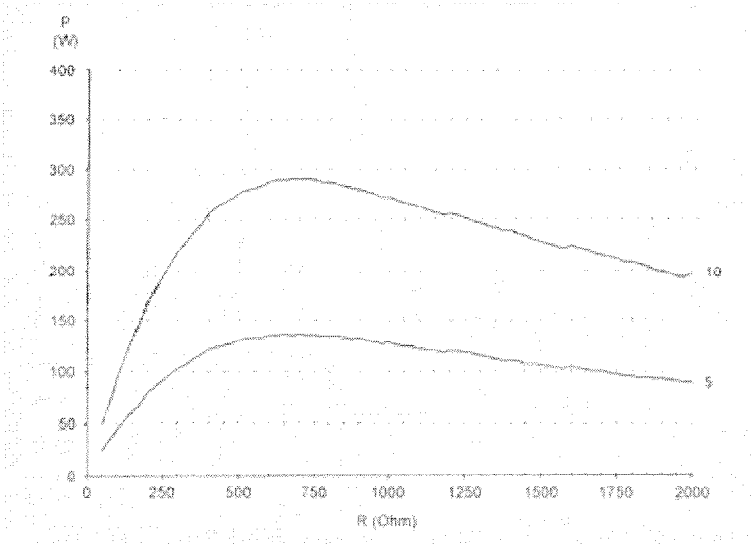
4.2.1.1 Current type: CUT I – steps 5 and 10



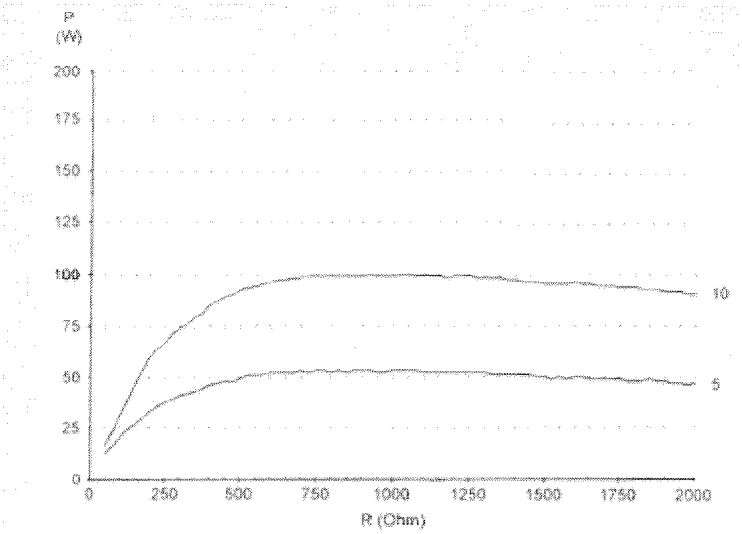
4.2.1.2 Current type: CUT II – steps 5 and 10



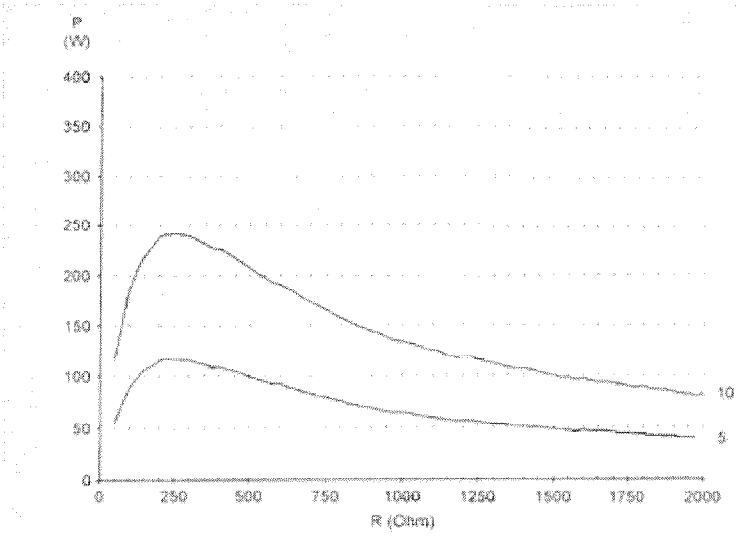
4.2.1.3 Current type: TUR – steps 5 and 10



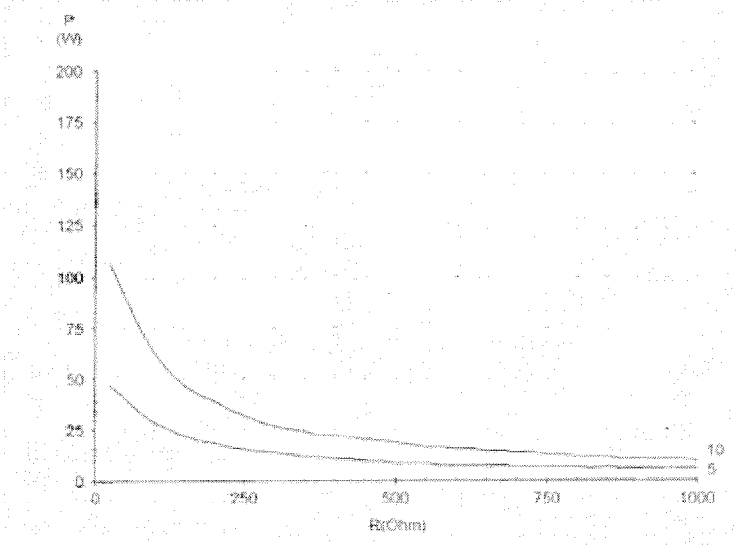
4.2.1.4 Current type: SPRAY COAGULATION – steps 5 and 10



4.2.1.5 Current type: CONTACT-COAGULATION – steps 5 and 10



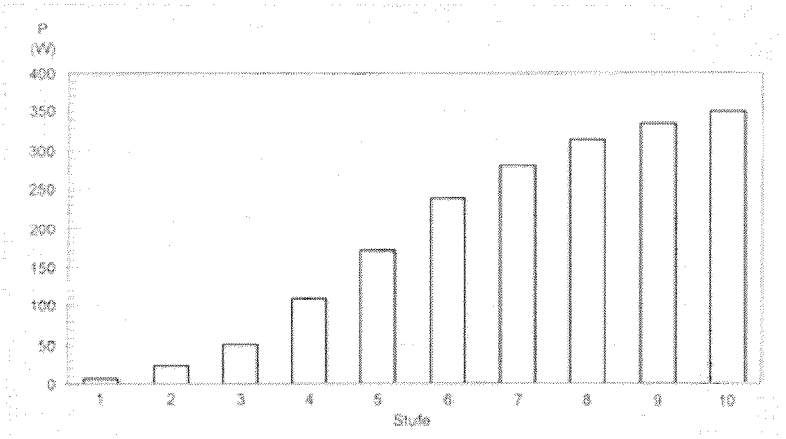
4.2.1.6 Current type: BI-COAGULATION – steps 5 and 10



4.2.2 Power output at each step of the output control

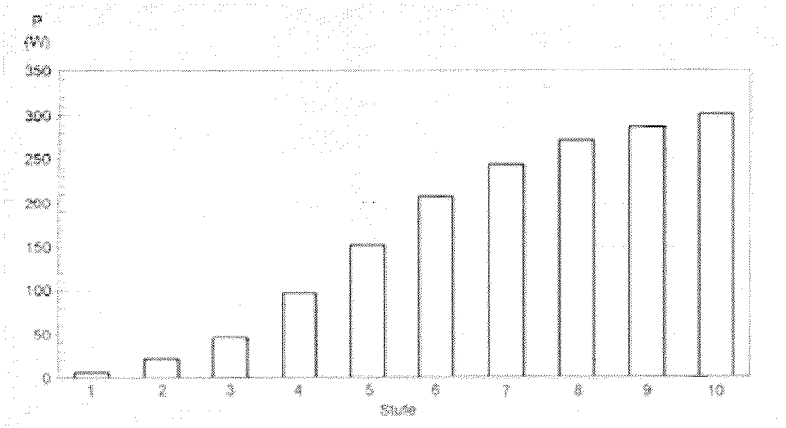
4.2.2.1 Current type: CUT I

Load resistance : 250 Ω



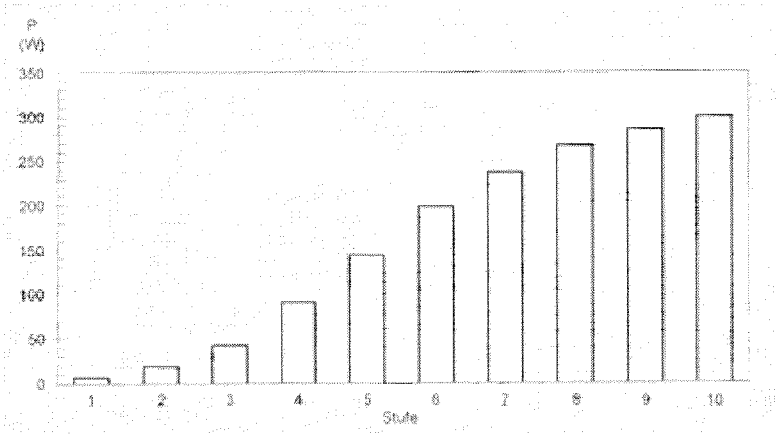
4.2.2.2 Current type: CUT II

Load resistance: 250 Ω



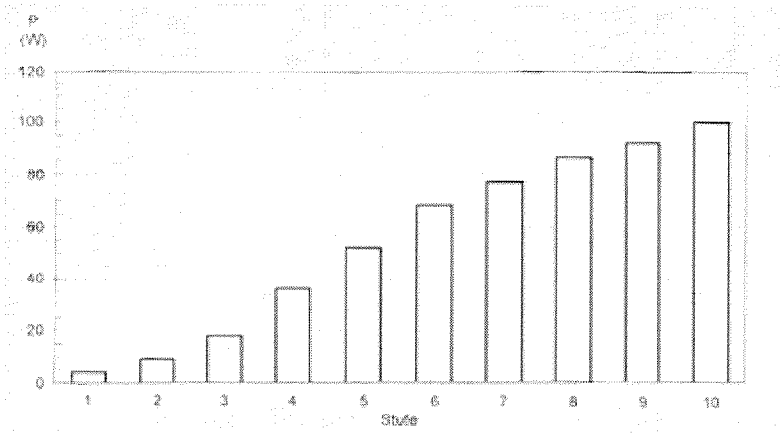
4.2.2.3 Current type: TUR

Load resistance: 700 Ω

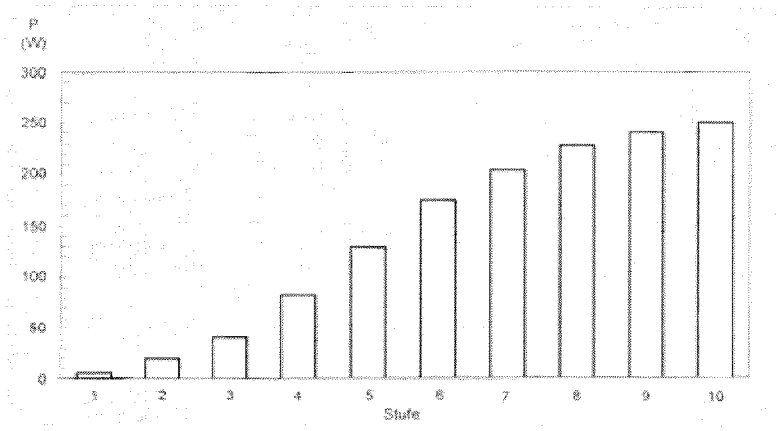


4.2.2.4 Current type: SPRAY-COAGULATION

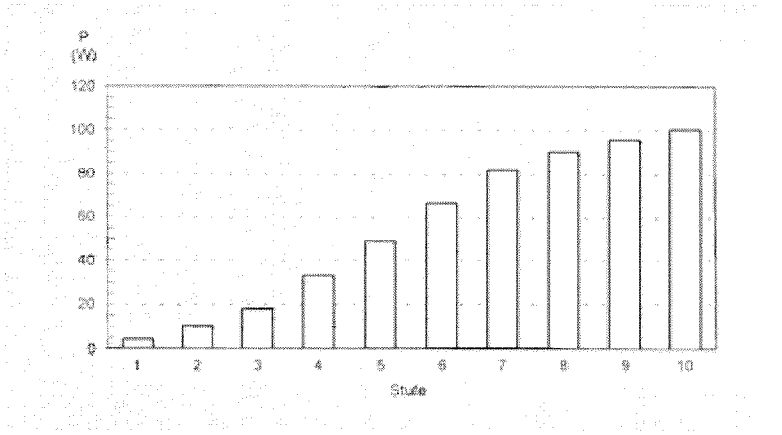
Load resistance: 940 Ω



4.2.2.5 Current type: CONTACT-COAGULATION Load resistance: 250 Ω



4.2.2.6 Current type: BI-COAGULATION Load resistance: 50 Ω



4.3. Technical description

4.3.1 Technical description Version 11.24

4.3.1.1 Mains connection

Mains voltage	110-120 / 220-240 V alternate current ± 10 % (See marking at the rear of the unit)
Nominal frequency	50/60 Hz
Power consumption	750 VA
Loading relationship	int. 10s/30s (Time relation: active / pause)
Mains fuses	2 each 2,5 A (inert) according to rating plate

4.3.1.2 HF current output and current characteristics

Cutting current

• CUT I

Nominal frequency	500 kHz
Current form	non modulated, sinus form
Crest factor	1,7
Max. HF no-load voltage	1470 peak to peak /440 V effective
Max. HF power	350 W/250 Ω
Unit output settings	10 position switch
Cutting qualities	minimal charring

• Cut II

Nominal frequency	500 kHz
Current form	modulated, sinus form
Crest factor	2,5
Max. HF no-load voltage	2980 peak to peak /600 V effective
Max. HF power	300 W/250 Ω
Unit output settings	10 position switch
Cutting qualities	medium charring

• Resection – transurethral or arthroscopic resection with flushing solution

Nominal frequency	500 kHz
Current form	non modulated, sinus form
Crest factor	1,6
Max. HF no-load voltage	2030 peak to peak /650 V effective
Max. HF power	300 W/625 Ω
Unit output settings	10 position switch
Cutting qualities	medium charring

• Spray coagulation (fulguration)

Nominal frequency	500 kHz
Current form	impulse modulated, sinus form
Crest factor	2,9
Max. HF no-load voltage	5180 peak to peak /910 V effective
Max. HF power	200 W/750 Ω
Unit output settings	10 position switch
Cutting qualities	non-contact, micro-arc, with limited surface charring and minimal depth penetration

• Contact coagulation

Nominal frequency	500 kHz
Current form	impulse modulated, sinus form
Crest factor	2,9
Max. HF no-load voltage	3330 peak to peak /580 V effective
Max. HF power	250 W/325 Ω
Unit output settings	10 position switch
Cutting qualities	micro-arc controlled, with limited surface carbonisation; partial electrode sticking is unavoidable

• Bipolar coagulation

Nominal frequency	500 kHz
Current form	non modulated, sinus form
Crest factor	1,6
Max. HF no-load voltage	340 peak to peak /100 V effective
Max. HF power	100 W/50 W
Unit output settings	10 position switch
Cutting qualities	micro-arc free coagulation without tissue carbonisation, with anti-sticking effect

4.3.1.3 Safety relevant data

Basic construction in accordance with	EN 60601-1
Protection class	I
Unit type	cardiac floating (CF)
Switching of neutral electrode	floating output
Neutral electrode monitoring	• continuous electronic control of neutral electrode cable • continuous electronic control of contact impedance with patient contact control, split neutral electrodes
Dosage shut-off due to unit malfunction	automatic
Timed active mode	acoustic signal after 10 seconds
Anti-malfunction control	self-check on switching on
HF. leakage control	automatic reduction in HF if the limit value is exceeded
Equipotential bonding	Connector plug

4.3.1.4 Dimensions and weight

Length x width x height = 400 x 380 x 130 mm

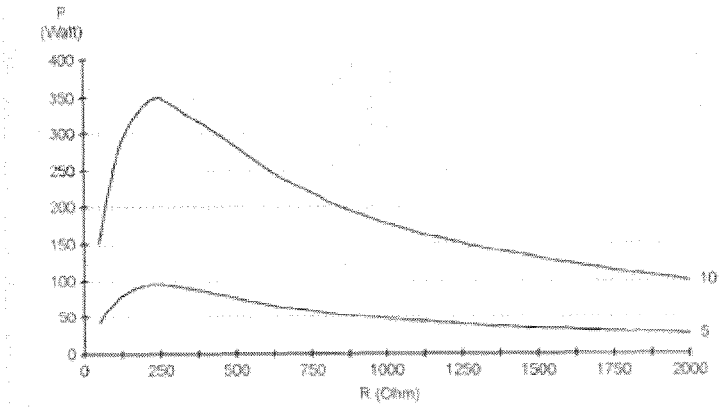
Weight: 9,5 kg

4.3.1.5 Certification CE 0123 conform with 93/42/EEC

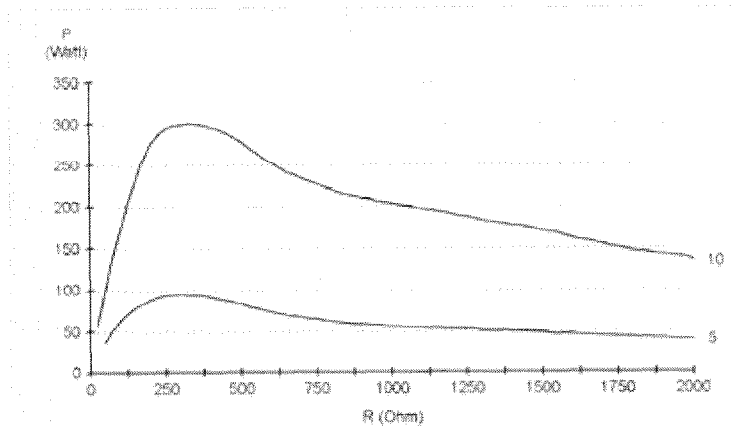
4.4 Power output diagram

4.4.1 Power output in relation to resistance (output characteristic)

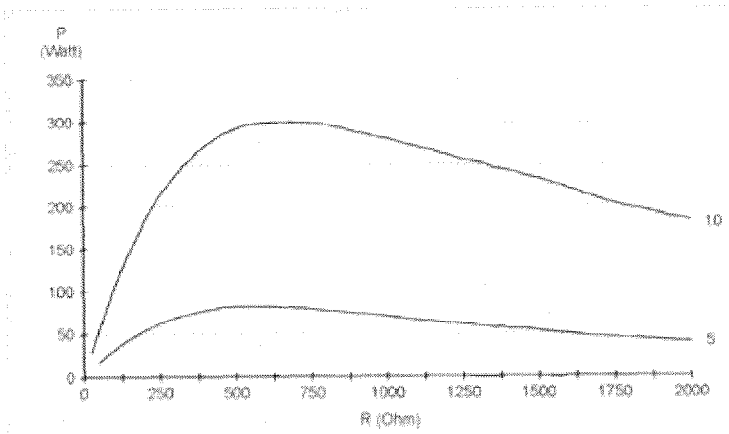
4.4.1.1 Current type: CUT I – steps 5 and 10



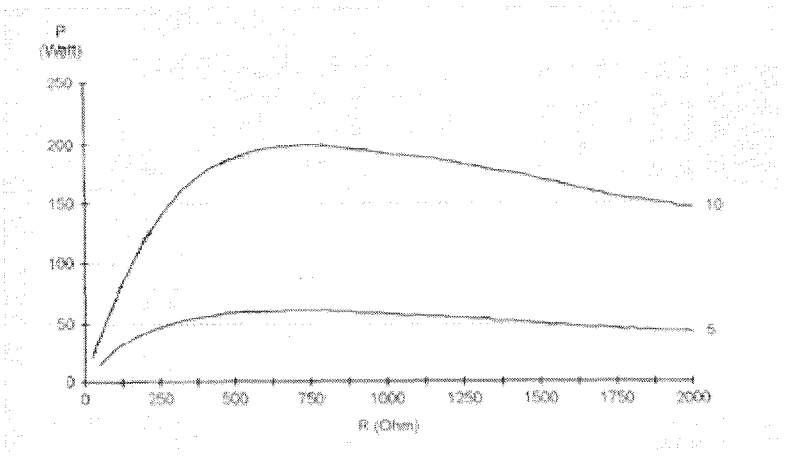
4.4.1.2 Current type: CUT II – steps 5 and 10



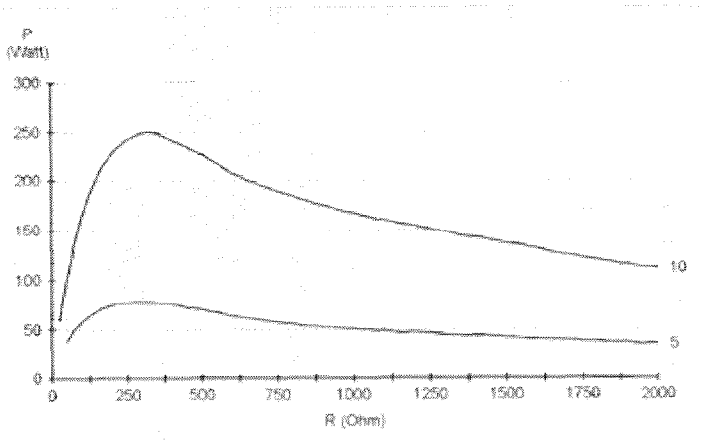
4.4.1.3 Current type: TUR – steps 5 and 10



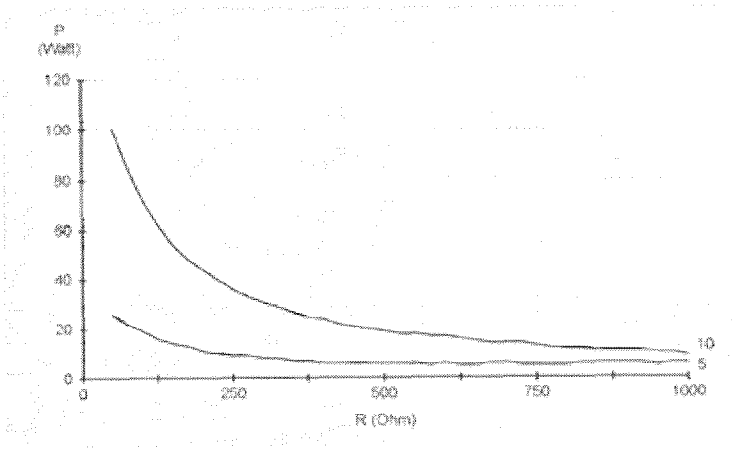
4.4.1.4 Current type: SPRAY COAGULATION – steps 5 and 10



4.4.1.5 Current type CONTACT-COAGULATION – steps 5 and 10

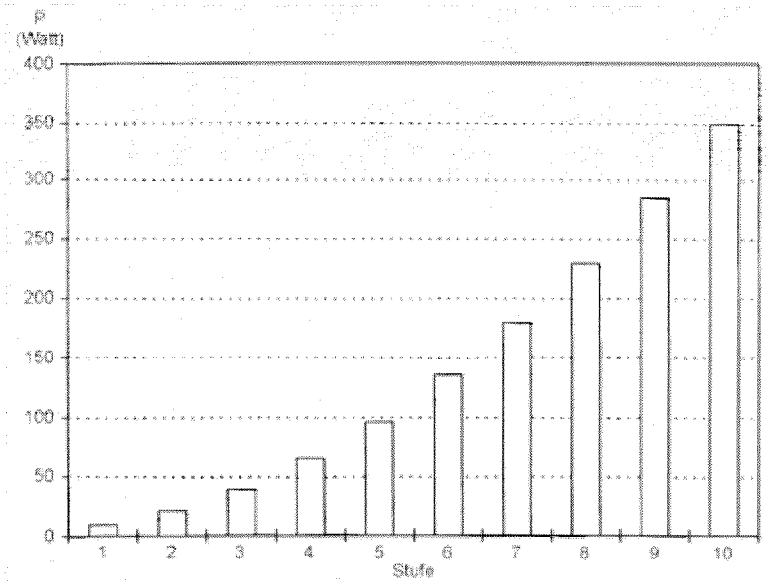


4.4.1.6 Current type: BI-COAGULATION – steps 5 and 10

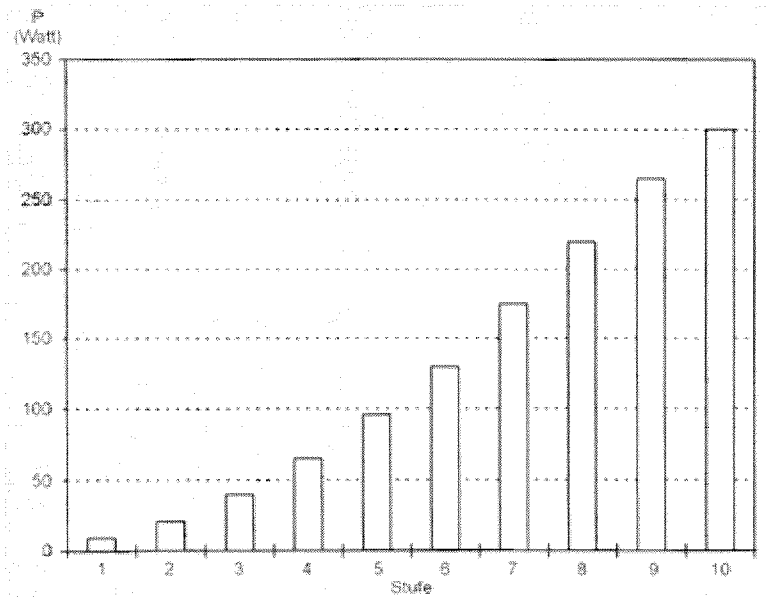


4.4.2 Power output at each step of the output control

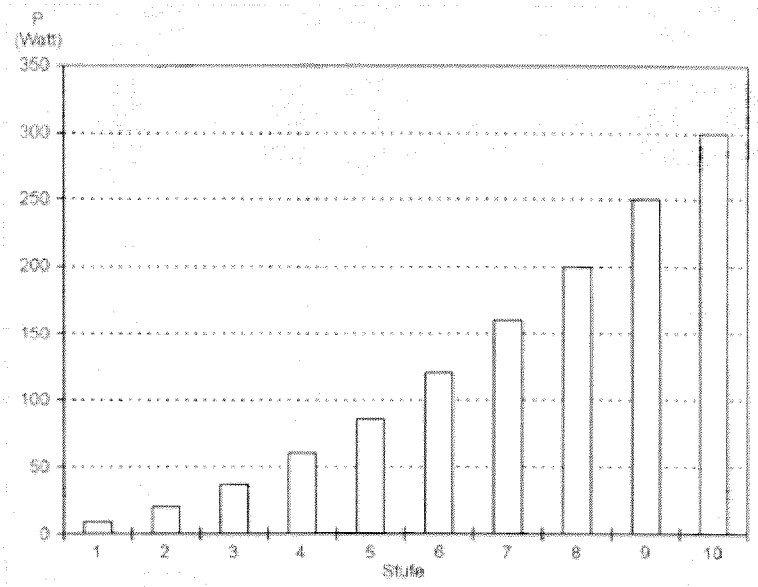
4.4.2.1 Current type: CUT I Load resistance: 250 Ω



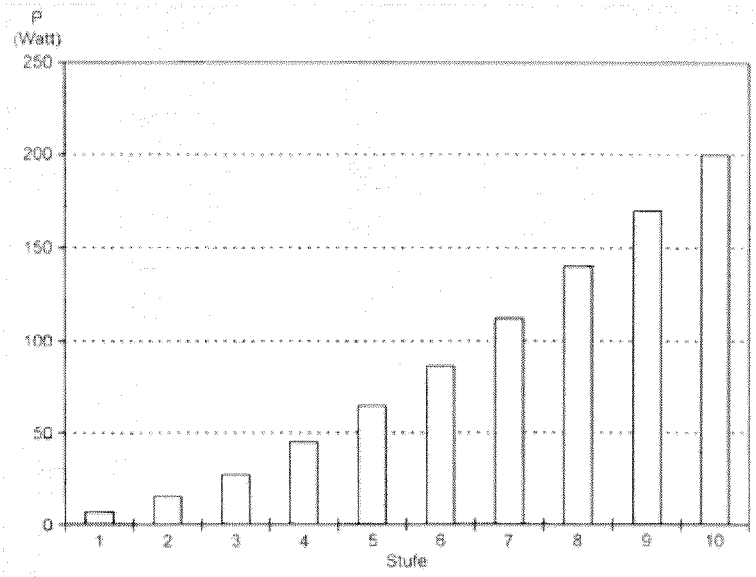
4.4.2.2 Current type: CUT II Load resistance: 325 Ω



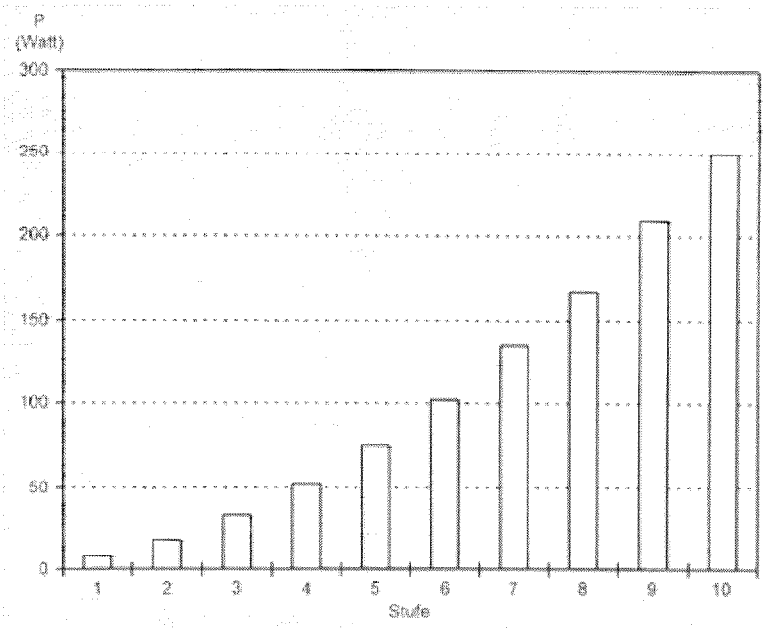
4.4.2.3 Current type: TUR Load resistance: 625 Ω



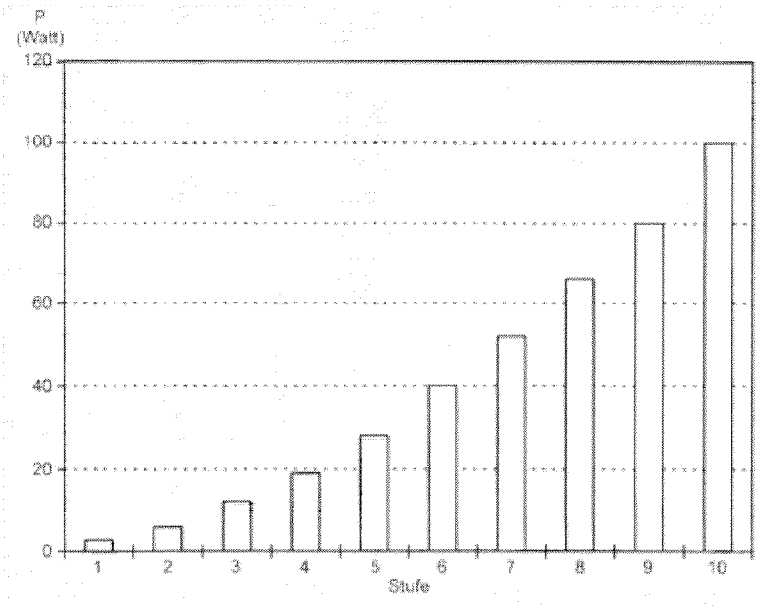
4.4.2.4 Current type: SPRAY-COAGULATION Load resistance: 750 Ω



4.4.2.5 Current type: CONTACT-COAGULATION Load resistance: 325 Ω



4.4.2.6 Current type: BI-COAGULATION Load resistance: 50 Ω



5. Fault Finding

Defect	Possible cause of the fault	How to solve the problem

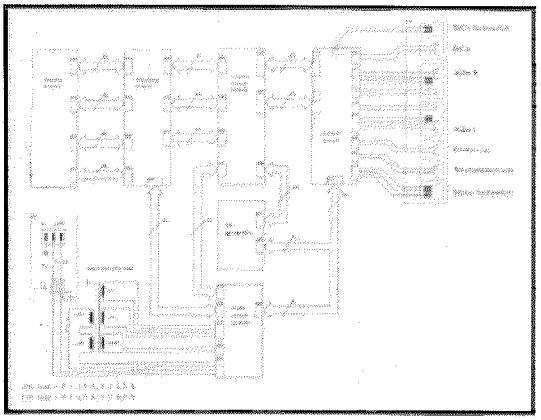
Green signal lamp of the STANDBAY ON-switch does not illuminate	Mains switch 36 on rear panel is not switched on or	Switch on I
	Fuse F1 or F2 are defective or	Replace fuse
	Defective mains cable	Replace cable
No RF current when hand piece switch is actuated	Fault in the hand piece cable or	Replace hand piece cable
	Defective hand piece or	Replace hand piece
	Defective foot switch	Replace foot switch
The neutral electrode monitoring alarm sounds and signal lamp 5 is illuminated	Neutral electrode is not connected or	Connect neutral electrode
	Interruption in the neutral electrode cable or	Replace neutral electrode cable
	Neutral electrode with patient contact monitoring has not been applied correctly	Replace neutral electrode
	Neutral electrode is defect	Replace neutral electrode
RF leakage current monitor gives visual signal (signal lamp 4)	Direction or the RF cable needs changing or	Use shortest possible cables and avoid cables running parallel to each other
	Patient has not been isolated from the table	Check isolated of patient from the table

If it is suspected that there is a more serious fault in the unit, it should be checked by a suitably qualified person.

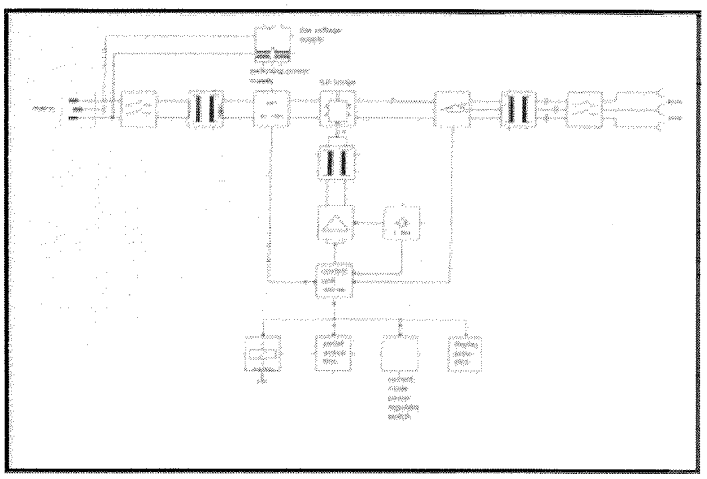
Attention!
In monopolar mode, RF output can only be activated by means of a hand piece with double finger switch or a double pedal foot switch. Operating with a hand piece equipped with only one switch or one single foot switch will not work.

Attention!
Before opening the unit, disconnect it from the mains in the case of a permanently installed unit (i.e. ceiling mounted unit) isolate it from the mains

6. Connecting Diagram ELEKTROTOM® 530



7. Power Circuit ELEKTOTOM® 530



8. Technical Description ELEKTROTOM® 530

8.1 Power supply

The power supply module contains:
• A pulse pause controlled power converter which produces from 0 to 180 volts with a current limited to 4 Ampere.
• The low voltage power supply produces a stabilized constant voltage of 10 volts and unstabilized constant voltages of 5 volts and 15 volts. With these voltages, digital and analogous areas, digital display and relays are supplied.

The galvanic separation of the power supply module from the network is realized through the application of the mains transformer.

8.2 RF-activation and application

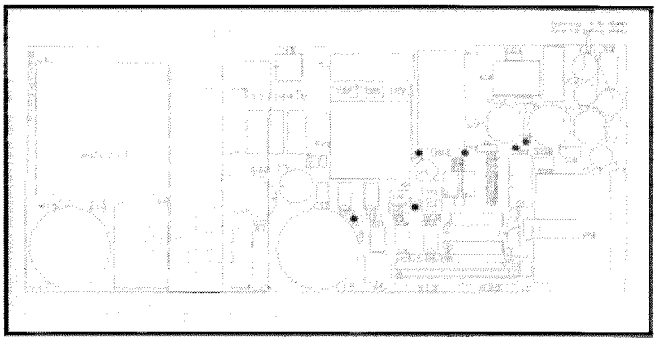
By means of the hand-/foot switch, the processor recognizes the order to apply RF-current and processes the application conditions set on the control segments before. Then the control logic forms a pattern pulse sequence for the RF-generator, which transforms the energy of the power supply module to an RF-current of 500 kHz and supplies the outlet through the corresponding relays.

During the application of RF-current, the function of the patient plate is controlled by the control logic. The application level is supervised by means of digital and analogous converters.

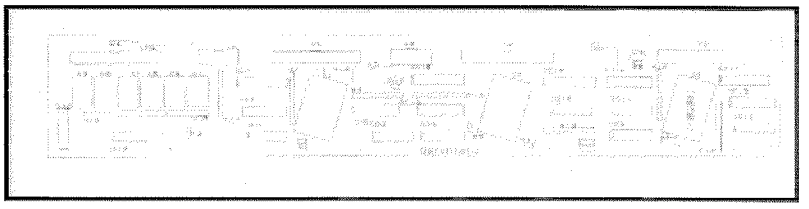
8.3 Main power supply

The mains supply circuit realizes four important functions:
• Switching the unit ON/OFF by means of relay K1. Relay K1 is supplied by T1, UZ1 and the contacts of K2.
• Energy exchange results through the pulse controlled transistor VT1. The components DD1, DA3 with their corresponding electronic components serve as pulse pause generator and steer on the transistor VT1 by an optic separation.
• The circuit set up with the components UZ2, UZ3, DA1, DA2 forms the auxiliary voltages 5 volts, 10 volts and 15 volts.
• The component DA4 supervises the current flowing to the generator, limits it and produces a logarithmic signal, which is used for automatic coagulation.

8.3.1 Main power supply



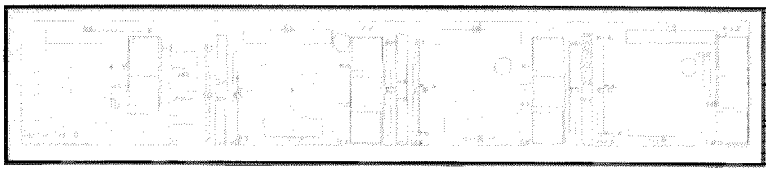
8.4 Board for control elements



The power control device is composed of three equal circuits.
Each is designed for a different current kind and functions as follows:
The position code with the change of setting of the rotary switch is refilled. The components 40174 (DD4, DD5, DD13, DD14, DD15) serve as intermediate buffer and deliver signals activating the corresponding diode through the driver components 2804 (DD16, DD17, DD18, DD7).
Simultaneously an analogous signal of 0 to 10 volts for power supply control is produced with the resistance matrix.

With the bistable relay and corresponding auxiliary controls the current kind is selected and stored up to the next operation..

8.5 Display board

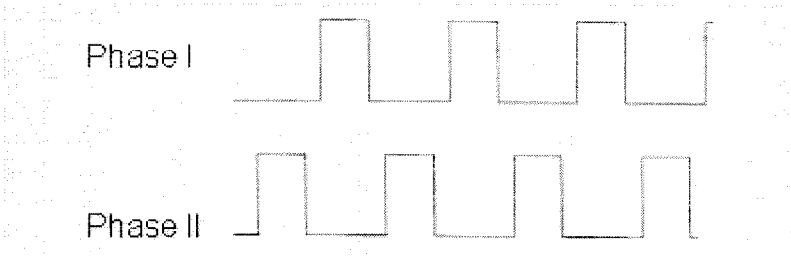


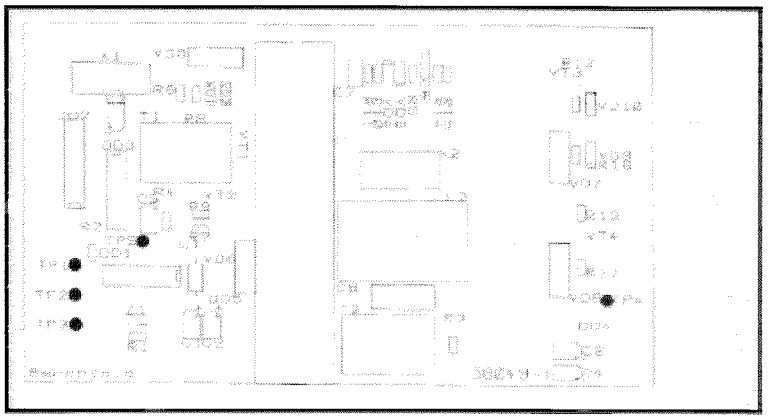
The display board is composed of diodes with serial resistors, lamps and sensors. All these parts are joined with the board for control elements through plugs and are activated or probed by the PC board directly.

8.6 RF-generator

The oscillation circuit consisting of the digital elements D1.A, D1.B and a quarz oscillator produces a nominal frequency of 4 MHz. The component DD2 divides the nominal frequency by 8 and forms a two-phase signal to-gether with the elements DD3.A, DD3.B.

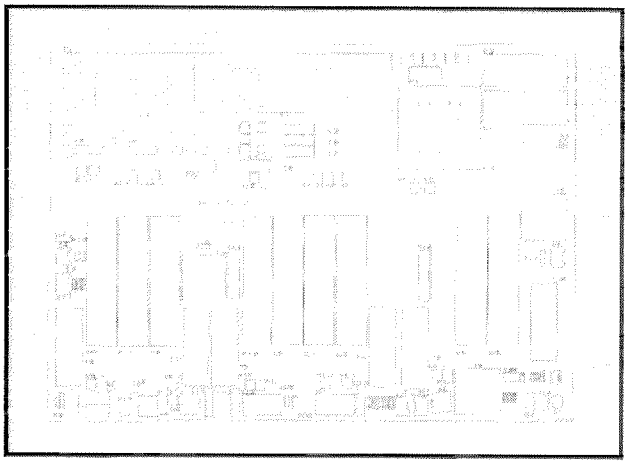
The digital switch DD1.C, DD1.D makes it possible to switch on/off RF-current or to form a modulated RF-current. The driver components DD4, DD5 take the RF-signal off the digital switch and secure the switch-over process of the amplifier. The RF-detector is set up with the element DD3.C according to a conventional scheme and shows "1" if RF-current flows, "0" if not.





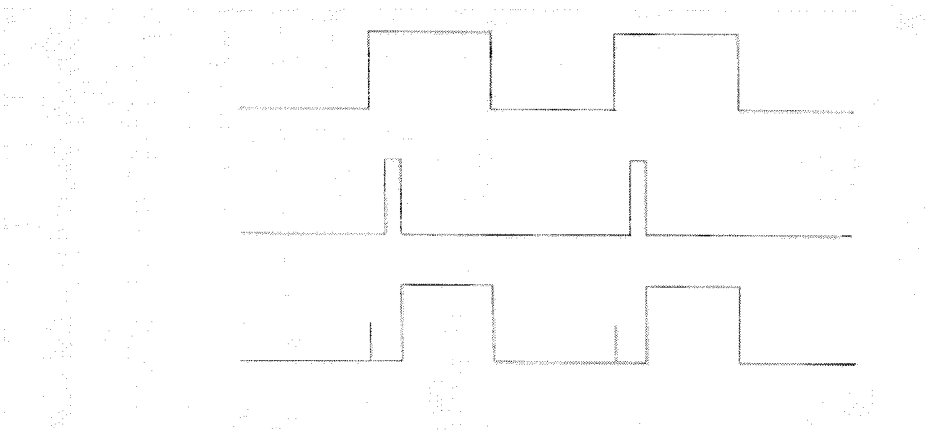
8.7 Patient circuit board

The current supplied by the RF-generator is galvanically separated from the application part through the transformer T1. The relays K1, K2 serve the optimization of the output power of the corresponding applications and have slight influence on the adaptation. The thrush L2 balances the output signal and serves as leakage current sensor. The relays K3 to K11 are needed for changes in adaptation or in output. The circuit DA1, VT1 enables "BICOMATIC"-function over monitoring of load resistance and is galvanically separated, supplied and probed by means of T10. All sensors (T2 to T10) except T6 are probed with a rectangular signal of 7,8 kHz. The neutral plate monitoring containing sensor T6, works with a frequency of 31,25 kHz.

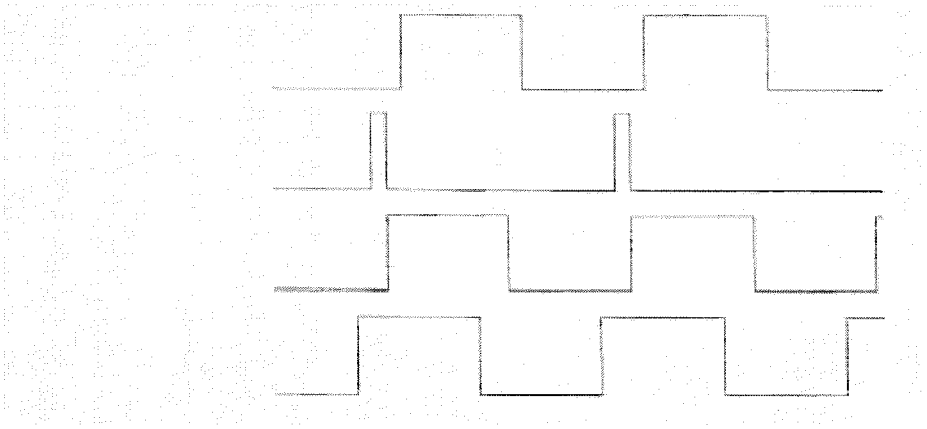


8.8 Control circuit board

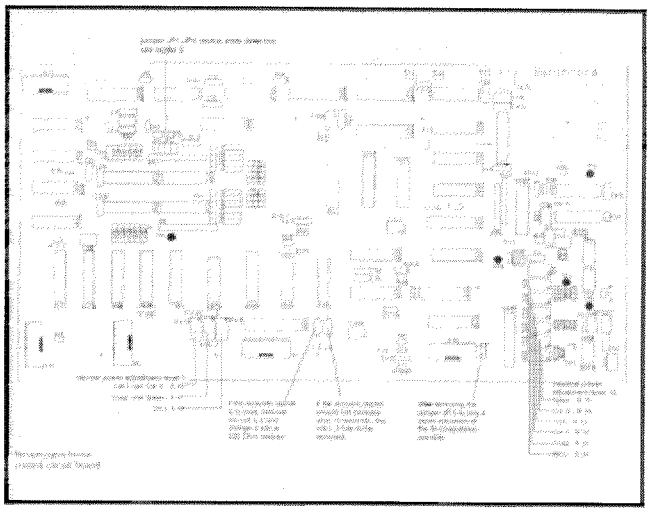
Hand-/footswitch-control-signal-detection: The test signal is transmitted to the sensors through the drivers DD2.A, DD3. Simultaneously, the alternated signals are separated according to their polarity and tested by the pulse detectors DD10, DD14, DD11 and DD13. The input signals of the component 40174 (DD14, DD13) with active/passive hand-/foot switch are the following:



Neutral plate monitoring (DD5.A, DD5.B, DD9, DD12.A) is similar to hand-/foot switch monitoring



8.8.1 Control circuit board



9. Neutral plate set up

9.1 Neutralel plate set up, valid up to version 11.21

The adjustment of the neutral plate monitoring circuit in the Elektrotom 530 is possible by set up of the jumper JP 1 - JP 4.
The digit "1" stands for the placement of a jumper.

	JP 4	JP 3	JP 2	JP 1	range of resistance tolerance ± 30 %	
	0	0	0	0	320 – 280 Ohm	
	0	0	0	1	280 – 245 Ohm	
	0	0	1	0	245 – 215 Ohm	
	0	0	1	1	215 – 190 Ohm	
	0	1	0	0	190 – 170 Ohm	
	0	1	0	1	170 – 150 Ohm	The average factory setting, up to Version 11.21, must be matched to the split neutral electrode
	0	1	1	0	150 – 130 Ohm	
	0	1	1	1	130 – 105 Ohm	
	1	0	0	0	105 – 85 Ohm	
	1	0	0	1	85 – 75 Ohm	
	1	0	1	0	75 – 65 Ohm	
	1	0	1	1	65 – 55 Ohm	
	1	1	0	0	55 – 40 Ohm	
	1	1	0	1	40 – 20 Ohm	
	1	1	1	0	17 – 43 Ohm	
	1	1	1	1	5 – 17 Ohm	

9.2 Neutral plate set up, valid for version 11.22 and 11.23

The adjustment of the neutral plate monitoring circuit in the Elektrotom 530 is possible by set up of the jumper JP 1 - JP 4.
The digit "1" stands for the placement of a jumper.

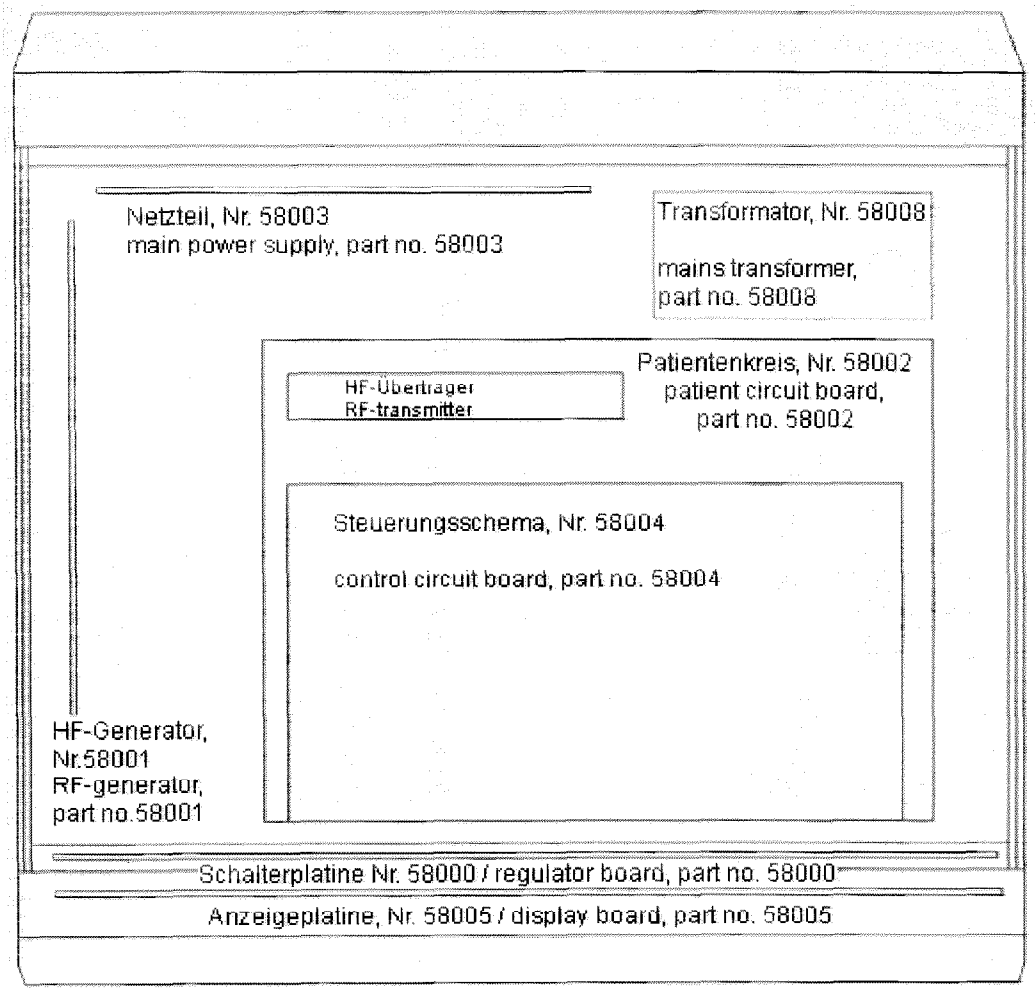
	JP 4	JP 3	JP 2	JP 1	range of resistance tolerance ± 30 %	
	0	0	0	0	600 – 1040 Ohm	
	0	0	0	1	420 – 790 Ohm	
	0	0	1	0	300 – 550 Ohm	
	0	0	1	1	240 – 425 Ohm	
	0	1	0	0	185 – 330 Ohm	
	0	1	0	1	150 – 270 Ohm	
	0	1	1	0	130 – 225 Ohm	
	0	1	1	1	95 – 190 Ohm	
	1	0	0	0	80 – 160 Ohm	
	1	0	0	1	65 – 135 Ohm	
	1	0	1	0	70 – 110 Ohm	
	1	0	1	1	45 – 85 Ohm	
	1	1	0	0	29 – 52 Ohm	
	1	1	0	1	15 – 26 Ohm	The average factory setting for Version 11.22 and Version 11.23 must be matched to the split neutral electrode
	1	1	1	0	17 – 43 Ohm	
	1	1	1	1	5 – 17 Ohm	

Neutral plate set up, valid for version 11.24

The adjustment of the neutral plate monitoring circuit in the Elektrotom 530 is possible by set up of the jumper JP 1 - JP 4.
The digit "1" stands for the placement of a jumper.

	JP 4	JP 3	JP 2	JP 1	range of resistance tolerance ± 30 %	
	0	0	0	0	> 790 Ohm	
	0	0	0	1	1300 – 2200 Ohm	
	0	0	1	0	600 – 1200 Ohm	
	0	0	1	1	420 – 880 Ohm	The average factory setting for Version 11.24 must be matched to the split neutral electrode
	0	1	0	0	300 – 550 Ohm	
	0	1	0	1	240 – 440 Ohm	
	0	1	1	0	170 – 340 Ohm	
	0	1	1	1	160 – 280 Ohm	
	1	0	0	0	125 – 230 Ohm	
	1	0	0	1	97 – 180 Ohm	
	1	0	1	0	80 – 160 Ohm	
	1	0	1	1	70 – 130 Ohm	
	1	1	0	0	55 – 110 Ohm	
	1	1	0	1	45 – 85 Ohm	
	1	1	1	0	17 – 43 Ohm	
	1	1	1	1	5 – 17 Ohm	

10. Localisation and description of boards



11. Spare part list

Valid for all versions

(11.10, 11.11, 11.12, 11.13, 11.16, 11.17, 11.20, 11.21, 11.22, 11.23, 11.24)

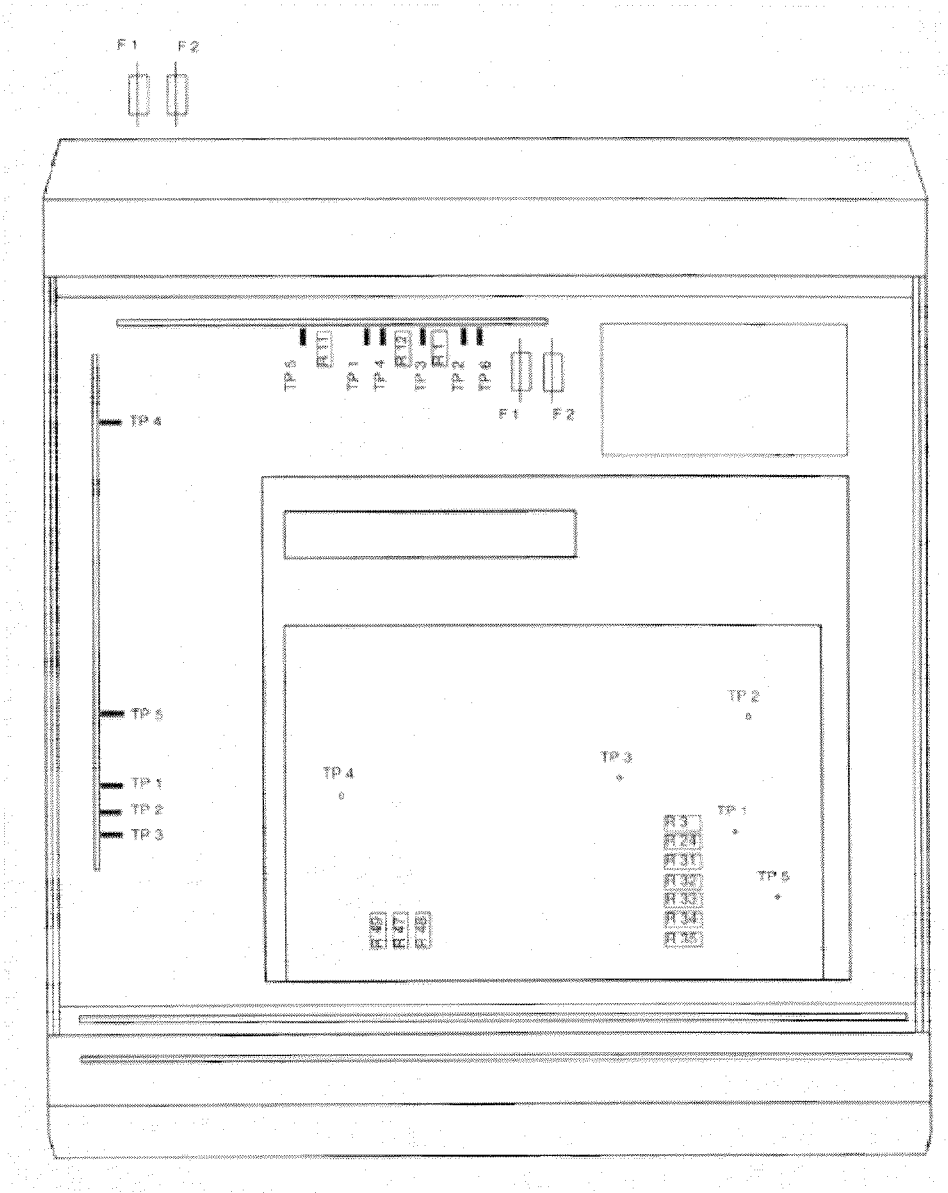
Description	Part no.
Mains transformer	63586
Front, not assembled	65226
Front foil	58027
Regulator button	52599
Rotary regulator, front	51345
Back, not assembeled	65225
RF-socket, bipolar	10887
Neutral electrode socket	9037
RF-socket, monopolar	58023
Foot-switch socket, bipolar, with wiring harness	58130
Foot-switch socket, monopolar	1592
Base of housing	58013
Cover of housing	58009
On/Off switch, back	52855
Tone generator	58121
Mains socket, back	44524
Miniature fuse 1 A (F1, F2), on mains power supply	49940
Main fuse 220 – 240 Volt 2,5 Amp. slow-blow	1743
Fuse label 2,5 Amp. slow-blow	11678
Main fuse 110 – 120 Volt 4,0 Amp. slow-blow	1745
Fuse label 4,0 Amp. slow-blow	1303
Fuse holder for mains fuses in back panel	55210
Rubber stand self adhesive	55270

Valid for version	11.10	11.11	11.12	11.13	11.16	11.17
Patient circuit board	58007*	58002*	59663	59877	59663	59877
Display and switching board complete with front panel	58011*	58006*	65234	65235	65234	65235
Control circuit board	58004	58004	59662	59662	59662	59662
Display board, front	58005	58005	58005	58005	58005	58005
Switching board, front	58000	58000	58000	58000	58000	58000
RF-generator	58001	58001	58001	58001	58001	58001
Mains power supply 230 Volt	58003	58003	58003	58003	58003	58003
Mains power supply 115 Volt	67084	67084	67084	67084	67084	67084

* in case of defect ESU must be sent to BERCHTOLD for .

Valid for version	11.20	11.21	11.22	11.23	11.24
Patient circuit board	59663	59877	59663	59877	59877
Display and switching board complete with front panel	65234	65235	65234	65235	65235
Control circuit board	65174	65174	65174	65174	
Display board, front	58005	58005	58005	58005	58005
Switching board, front	58000	58000	58000	58000	
RF-generator	58001	58001	58001	58001	58001
Mains power supply 230 Volt	58003	58003	58003	58003	58003
Mains power supply 115 Volt	67084	67084	67084	67084	67084

12. Testpoints, localisation of fuses



13. Troubleshooting and adjustment

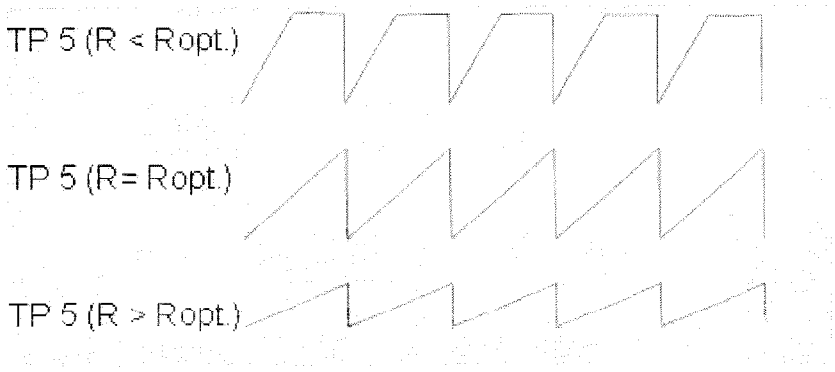
13.1 Unit cannot be switched "ON"

- Is switch at the rear in "ON"-position?
- does the mains voltage correspond to the imprint on the nameplate?
- check mains cable
- check mains voltage
- check fuses in rubber connector (rear), 2 x 2,5 Amp.
- open cover - 2 x recessed head screw
- check plug connection X 5 of p.c. board for check elements to mains supply circuit X 3
- check fuses on mains supply circuit, F1/F2 1 Amp. miniature (see page 35)
- Only if fuses are defective !
  1.)disconnect plugs X 4 and X 7 from mains supply circuit
  2.)install two new fuses
  3.) switch "ON" unit again
  if fuses melt again, completely exchange mains supply circuit,
- check "ON"-switch on p.c. board for check elements in the front part
- check relays K 1 and K 2 on mains supply circuit, check the relays operate only if relays do not operate: see option 2

13.2 How to check mains supply circuit

- check supply voltage 12 volts DC (+/- 15%) for K1/K2/driver DD2 at TP3/TP4
- check supply voltage 10 volts for RF-generator-driver/display PC board/control PC board at TP 6/TP 2, not adjustable
- check frequency of 50 kHz, at TP 1/TP 6, correction trimmer R 1

- control sawtooth signal of 10 Vss at TP 5/TP 6, correction trimmer R 11



13.3 The light beam indicator and/or the output power do not react to increase/reduction of power regulators

- control position of the output rotary regulators, check knobs are in one 1/2 way state. i.e. 1,5, 2,5 etc. incorrect
- Pay attention to operating instructions

13.4 One/or several beams of the bar indicator remains dark

- check individual LED´s and, if necessary, exchange it - check driver component ULN 2804 A on PC board and exchange it if necessary

13.5 A beam segment is skipped

- check rotary regulators and exchange if necessary

13.6 The respective push buttons do not react when selecting current mode

- check plug connection X 1 on pc board is connected:
- check 10 volt is at pin 5 of X 1, unit in standby
- check 0 volt is at pin 5 of X 1, unit activated
  if not 0 volts, the unit is activated or faulty control board - do exchange control board
- Impossible to select more then one cutting function in electrotomie: check relays K 3/K 4 on the board
- Impossible to select more then one coagulation function in coagulation: check relay K 5 on board examine
- Impossible to select more then one coagulation function in Bi-coagulation: check relay K 1 on board
- impossible to toggle bipolar/hand-/foot push button switch: check relay K 6 on board
- impossible to toggle bipolar automatic push button: check relay K 2 on board

13.7 No Rf-indication/acoustic signal for foot-/hand activation

- foot switch/cable/or handle/cable for defect
- monopolar RF-cable not connected
- monopolar Rf-cable is connected to socket 27 and 28/foot activation not possible
- if patient plate or cable is not connected
- alarm sound for plate
- did you adjust the correct bipolar activation mode (hand/foot)?

13.8 No RF-indication despite RF-output with acoustic signal

- check indicator H 17/H 18/H 19 on display board
- check on RF-detector, component DD 3 (IC 4075) on RF-generator

13.9 No acoustic signal despite RF-output and RF indication

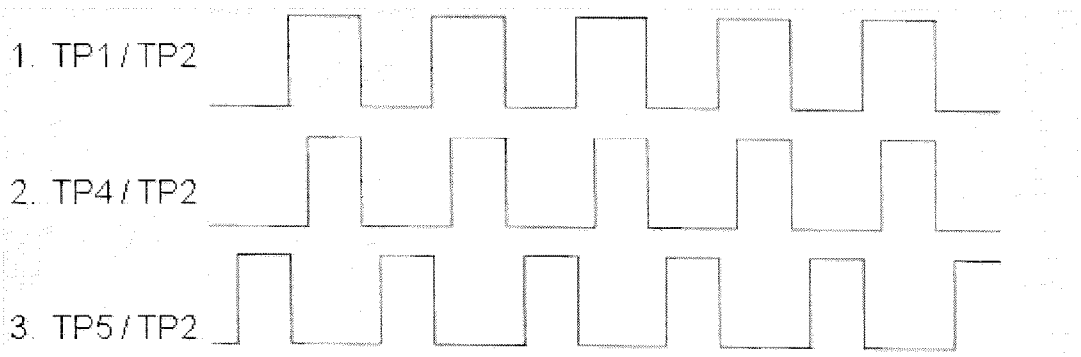
- check loudspeaker, inside resistance approx. 15 Ohm

13.10 RF indication and acoustic signal despite RF-output

- check component DD3, IC 4075 on RF-generator board

13.11 No RF-power/indication/acoustic signal despite activation

- check RF-generator:
  at TP 3/TP 2 GND must have a supply voltage of approx. 10 volts, not adjustable
  if 10 volts not o.k - check mains supply circuit (see option 2.)
  Connect oscilloscope to TP 1/2 GND, the generator's frequency must be 500 kHz,(see oscilloscope No. 1), not adjustable
- if frequency not o.k. - change quartz
- connect Oscilloscope to TP 4/TP 2 GND, activate cutting I/TUR by hand/foot, the unmodulated signal is transmitted to the amplifier (see oscilloscope No. 2)
- Connect oscilloscope to TP 5/TP 2 GND, measuring must correspond to oscilloscope No. 3.



13.12 No RF-output despite optic and acoustic signal

- check the relays K 3 - K 11 on patient circuit board

13.13 Examine control circuit board

- connect oscilloscope to TP 4/2 GND. There must be a frequency of 250 kHz
- connect multimeter to TP 3/2 GND. There must be a supply voltage of 10 volts if not, check 10 volts supply voltage of mains board and check interconnection
- connect multimeter to TP 1/TP 2 GND. Switch unit on and activate unit if voltage > 0 volts < 5 volts the leakage current suppression is activated (see page 31 point 3 - pilot light for RF leakage current monitoring illuminates)
- connect multimeter to TP 5/TP 2 GND. According to the power adjusted at the rotary there should be a voltage between 0,5 volts and 7,0 volts - the unit must be switched on and activated.

13.14 The automatic switch off mode with contact- and bipolar contact coagulation does not function

- check component DA 4 on the power supply board and the cable connections to the control circuit board
- check component DA 3 on control circuit board.

13.15 - Symbol at the front lights

- check power transistor/driver/optoelectronic coupler on main power supply board and RF generator board.
- check relays K 1 and K 2 on patient circuit PC board for functionality

13.16 Bipolar current is activated automatically without accessory in the hand mode

- Note: This con be proven by RF indication and RF sound
- check component DA 1 (TLC 271 CP) on patient circuit pc board

13.17 Monopolar function of the unit cannot be activated

- check the socket of outlet I up to plug connection X 10 and T 2 + T5 on contact
- check the socket of outlet II up to plug connection X 7 and T 11 + T4

13.18 Adjustment of maximum RF-power at level 10 of the rotary regulator

13.18.1 to Version 11.23

- All adjustments have to be made on the control circuit

Cut I	on 350 Watt at	250 Ohm	with trimmer R 32
Cut II	on 300 Watt at	250 Ohm	with trimmer R 34
TUR/Res	on 300 Watt at	700 Ohm	with trimmer R 33
Contact	on 250 Watt at	250 Ohm	with trimmer R 31
Spray	on 100 Watt at	1000 Ohm	with trimmer R 35
Bipol-C	on 100 Watt at	50 Ohm	with trimmer R 24

- Note: The output at level 5 (50% power) can not be adjusted The above adjustments can not be made unless the correct equipment is used
- The legal ratings of maximum power are to be calculated with 20% tolerance.

13.18.2 Version 11.24

- All adjustments have to be made on the control circuit

Cut I	on 350 Watt at	250 Ohm	with trimmer R 32
Cut II	on 300 Watt at	325 Ohm	with trimmer R 34
TUR/Res	on 300 Watt at	625 Ohm	with trimmer R 33
Contact	on 250 Watt at	325 Ohm	with trimmer R 31
Spray	on 200 Watt at	750 Ohm	with trimmer R 35
Bipol-C	on 100 Watt at	50 Ohm	with trimmer R 24

- Note: The output at level 5 (50% power) can not be adjusted The above adjustments can not be made unless the correct equipment is used
- The legal ratings of maximum power are to be calculated with 20% tolerance

13.19 Adjustment of minimum RF-power at level 1

- Cut I/Cut II/TUR < 10 watt with trimmer R 49
- Contactcoag. < 10 watt with trimmer R 47
- Spray < 5 watt with trimmer R 47 at 1000 Ohm
- BiCo < 5 watt with trimmer R 48 at 50 Ohm

Remark:
Choose the respectively optimal load resistance in order to control power at level 1, see option 13.18