

Specificație Tehnică Completată

Anexa 5 Unitate electrochirurgicala

Model: ARC 350 Reg. SDM: DM000569536

Producător: BOWA-ELECTRONIC GMBH & CO.KG

Țara: GERMANIA

| Specificarea tehnică deplină solicitată, Standarde de referință | Specificația tehnică propusă de ofertant |
|---|---|
| <p>Unitate electro-chirurgicală:</p> <p>Porturi de operare: Monopolar, Bipolar,</p> <p>Sigilare vaselor;</p> <p>Suportă moduri de lucru avansate, cu putere reglabilă, adaptabile în funcție de impedanța țesuturilor.</p> <p>Funcție de autotestare automată la pornire</p> <p>Afișare digitală a parametrilor de lucru.</p> <p>Indicatori vizuali și acustici pentru activare, eroare sau finalizare cicluri.</p> | <p>Unitate electro-chirurgicală: Model ARC 350, BOWA pag.1 din ARC 350-user_manual</p> <p>Opțiunea LIGARE activă Opțiunea Rezectie bipolară activă</p> <p>Porturi de operare: Monopolar, Bipolar DA, pag.1 din ARC 350-user_manual, 2porturi: Monopolar, 2 porturi: Bipolar</p> <p>Sigilare vaselor; DA, regim LIGATION, TissueSeal PLUS pag.54. Se folosesc porturile de operare pentru regimul Bipolar conform pag. 1 din ARC 350-user_manual</p> <p>Suportă moduri de lucru avansate, cu putere reglabilă, adaptabile în funcție de impedanța țesuturilor. DA, conform paragrafului 10.2. Output, voltage and current diagrams (Diagrame de iesire, tensiune si curent) se prezinta graficele pentru toate regimurile: Puterea de iesire functie de rezistenta(impedanta) tinand cont de Efectul setat, pag.81-118 din ARC 350-user_manual</p> <p>Funcție de autotestare automată la pornire DA, ISSys (Integrated Safety System), Continuous self-test: reprezinta autotestarea atat la pornire cat si in timpul functiunii pag.75 din ARC 350-user_manual. Descrierea procesului de pornire si testare al aparatului este descrisa la pag.24 ARC 350-user_manual.</p> <p>Afișare digitală a parametrilor de lucru. DA, pag.3 din ARC 350-brochure</p> <p>Indicatori vizuali și acustici pentru activare DA, Activation indication</p> |

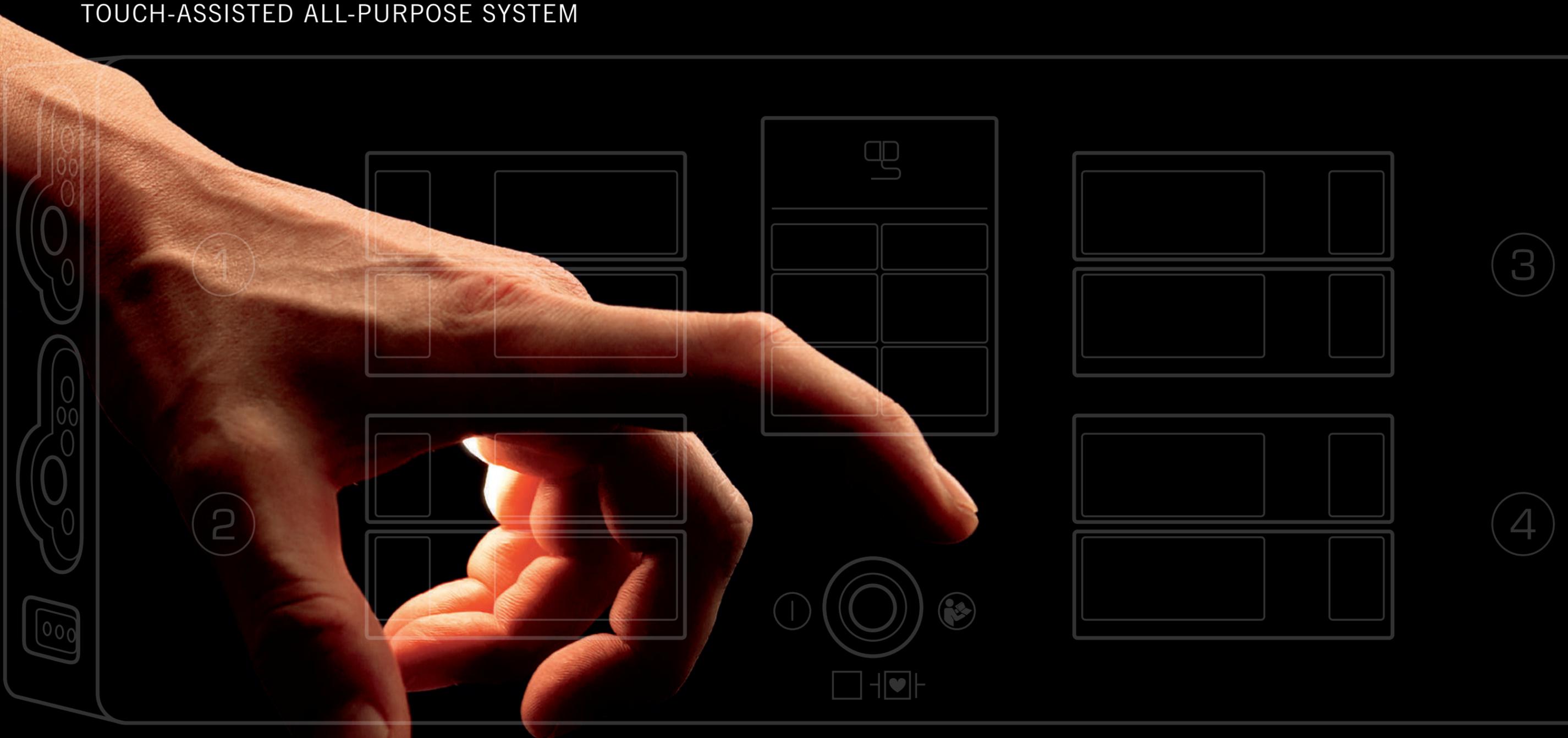
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| <p>Control al volumului semnalelor sonore.</p> <p>Posibilitatea de salvare și încărcare a programelor personalizate (programe de utilizator).</p> <p>Recunoaștere automată a instrumentelor conectate (manipulează automat setările corespunzătoare).</p> <p>Software integrat pentru rezecție bipolară în mediu salin.</p> <p>Compatibilitate cu comutatoare de picior pentru modurile: Monopolar (tăiere/coagulare) Bipolar (coagulare, rezecție), Sigilare vasculară/plasma</p> <p>Moduri de lucru: Monopolar: Tăiere pură: min. 330 W / 200 Ohm.</p> <p>Tăiere cu hemostază (blend): min. 200 W / 200 Ohm.</p> | <p>Monopolar 1/2, Activation indication Bipolar 3/4, pag.18 din ARC 350-user_manual</p> <p>Indicatori eroare DA, pag.65-69 din ARC 350-user_manual</p> <p>Indicatori finalizare cicluri. DA, pag.67 din ARC 350-user_manual</p> <p>Regim GastroCut</p> <p>Mesaj GastroCut Notice- The polypectomy has been completed</p> <p>Regim LIGATION</p> <p>Mesaj LIGATION NOTICE- The LIGATION has been completed</p> <p>Control al volumului semnalelor sonore. DA, pag.57 din ARC 350-user_manual</p> <p>Posibilitatea de salvare și încărcare a programelor personalizate (programe de utilizator). DA, pag.2 din ARC 350-brochure, posibilitatea de a salva 350 de programe</p> <p>Recunoaștere automată a instrumentelor conectate (manipulează automat setările corespunzătoare). DA, pag.2 din ARC 350-brochure, functia Plug & Cut</p> <p>Software integrat pentru rezecție bipolară în mediu salin. DA, pag.51 din ARC 350-user_manual, Bipolar resection</p> <p>Compatibilitate cu comutatoare de picior pentru modurile: Monopolar (tăiere/coagulare) DA, pag.25 din ARC 350-user_manual Bipolar (coagulare, rezecție), DA, pag.25 din ARC 350-user_manual Sigilare vasculară/plasma DA, pag.25 din ARC 350-user_manual, LIGATION, TissueSeal PLUS sunt regimuri bipolare</p> <p>Moduri de lucru: Monopolar: Tăiere pură: min. 330 W / 200 Ohm. DA, pag.81 din ARC 350-user_manual, regim Monopolar Cutting-Standard, Efect 1 Tăiere cu hemostază (blend): min. 200 W / 200 Ohm. DA, pag.81 din ARC 350-user_manual, regim Monopolar Cutting-Standard, Efect 2-9. <u>Valoarea numerica al acestui parametru indica gradual si efectul de hemostaza dorit. In concluzie: cu cat este setata o valoare mai mare al acestui parametru, cu atat si efectul de hemostaza are sa fie mai mare</u> Conform manualului al Academiei BOWA, PAG.7</p> |
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| <p>Coagulare tip spray (fulgurate): min. 100 W / 500 Ohm.</p> | <p>Coagulare tip spray (fulgurate): min. 100 W / 500 Ohm. DA, pag.98 din ARC 350-user_manual, regim Spray</p> |
| <p>Coagulare moale: min. 120 W / 75 Ohm.</p> | <p>Coagulare moale: min. 120 W / 75 Ohm. DA, pag.94 din ARC 350-user_manual, regim Moderate</p> |
| <p>Coagulare cu argon (dacă este oferită): min. 100 W / 500 Ohm</p> | <p>Coagulare cu argon: min. 100 W / 500 Ohm DA, pag. 99 din ARC 350-user_manual, regim Argon Open</p> |
| <p>Bipolar: Coagulare în mediu salin: min. 120 W / 25 Ohm.</p> | <p>Bipolar: Coagulare în mediu salin: min. 120 W / 25 Ohm. DA, pag.118 din ARC 350-user_manual, Bipolar Resection</p> |
| <p>Coagulare forțată: min. 100 W / 50 Ohm.</p> | <p>Coagulare forțată: min. 100 W / 50 Ohm. DA, pag.114 din ARC 350-user_manual, regim Forceps forced</p> |
| <p>Coagulare moale: min. 100 W / 30 Ohm.</p> | <p>Coagulare moale: min. 100 W / 30 Ohm. DA, pag. 111 din ARC 350-user_manual regim Standart forceps</p> |
| <p>Rezeecție salină: min. 230 W / 25 Ohm</p> | <p>Rezeecție salină: min. 230 W / 25 Ohm DA, pag.109 din ARC 350-user_manual Bipolar resection</p> |
| <p>Sigilare vaselor (fuziune de țesut, sigilarea vaselor de legătură sau echivalent): Putere: min. 140 W / 25 Ohm.</p> | <p>Sigilare vaselor (fuziune de țesut, sigilarea vaselor de legătură sau echivalent): Putere: min. 140 W / 25 Ohm. DA, pag.115 din ARC 350-user_manual, regim Ligation, TissueSeal PLUS</p> |
| <p>Capacitatea de a sigila vase de sânge și limfatice de până la 7 mm în diametru.</p> | <p>Capacitatea de a sigila vase de sânge și limfatice de până la 7 mm în diametru. DA, pag.5 din Arc 350-brochure</p> |
| <p>Electrod neutru reutilizabil - 1 buc;</p> | <p>Electrod neutru reutilizabil - 1 buc; DA, cod 242-003 din BOWA-accesorii</p> |
| <p>Mâner monopolar reutilizabil (creion) pentru electrod, cu cel puțin două butoane de operare - 1 buc</p> | <p>Mâner monopolar reutilizabil (creion) pentru electrod, cu cel puțin două butoane de operare - 1 buc DA, cod 220-145 din BOWA-accesorii</p> |

Anexa 5

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| <p>Set de electrozi (min. 3 buc.) de diferite dimensiuni și forme (minge, lamă, ac) - 2 buc</p> <p>Cablu monopolar de cel puțin 3 m lungime (pentru conectarea instrumentelor laparoscopice) - 2 buc</p> | <p>Set de electrozi (min. 3 buc.) de diferite dimensiuni și forme (minge, lamă, ac) - 2 buc Tip lama DA, cod 500-007 din BOWA-accesorii-7 buc. Tip ac DA, cod 500-011 din Bowa-accesorii-7 buc. Tip minge DA, cod 500-021 din Bowa-accesorii-7 buc</p> <p>Cablu monopolar de cel puțin 3 m lungime (pentru conectarea instrumentelor laparoscopice) - 2 buc DA, cod 385-050 din BOWA-accesorii</p> |
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ARC 350
ELECTROSURGICAL UNIT
TOUCH-ASSISTED ALL-PURPOSE SYSTEM



BOWA
ARC
350

Heart and soul for the OR

The best is never good enough, for beyond it lie new discoveries and new solutions. It is our shared passion for a field in which we both excel, each in our own way. And it is this same passion that gives each of us the ability to achieve outstanding accomplishments.

Take advantage of the latest innovations in the field of electrosurgery units with the ARC 350. Discover a high-tech system as an all-purpose base that can be flexibly extended to meet your individual requirements.

Clever innovations for your OR

The ARC 350 is a clever all-in-one-generator that is winning over customers with its clearly understandable operating concept and innovative functionalities. Thus, all device settings are pre-programmed for numerous standard procedures. Inside, processors ensure optimum integrated arc control at all times, while self-checking programs continuously ensure maximum safety. Four separate outputs can be individually configured with ease and operating personnel can check the settings visually at any time.

Ideal applications for the ARC 350 in HF surgery:

- General, visceral, thoracic and paediatric surgery
- Gynaecology
- Gastroenterology
- Urology
- ENT
- Plastic and aesthetic surgery
- Orthopaedic and trauma surgery
- Oral and maxillofacial surgery
- Neurosurgery
- Cardiac surgery



Effective use

Every field has specific requirements, every team works differently and a wide range of diverse instruments are called on to be used.

Select the pre-configured indication-orientated standard values or create a program on one of the 350 memory locations for your own specific field or to meet your individual needs.

Assisted operation

Process optimisation and quality assurance in the OR start with the user-friendliness of the systems. The unit's interactive fingertip operation and touch-assisted glass front panel and clear relationship between the controller and instrument give users a complete overview.

The Plug & Cut function recognises instruments and Plug & Cut COMFORT* also automatically preselects the right basic settings for the COMFORT instruments connected.

*Optional

Simply efficient

Its ease of use and safe operation, its special LIGATION function and the ability to connect up to four instruments to the ARC 350 simultaneously save valuable OR time.

The ARC 350 communicates with other system components via standard connections and software can also be easily updated via a USB port, ensuring you can also work efficiently in future.

The interactive touch assistance system securely guides you to the right setting

Touchpad technology for enhanced assistance in the OR

With the ARC 350, you have direct fingertip control of all device functions via the interactive glass touchpad. Effects and individualised settings can be selected via the touchscreen area. Messages are issued in plain text supported by graphic symbols, ensuring that the team retains a clear overview at every stage throughout hectic everyday work in the OR.

Simply intuitive

Power is to be reset? Simply touch the respective figure with your fingertip. The glass touchpad of the ARC 350 is divided into four quadrants that correspond to the four sockets on the sides: if you attach an instrument to the upper right bipolar socket (3), for example, the upper right socket indicator is brightly lit.

Always work with the correct socket

The socket indicator identifies the socket on which the settings are to be altered.

Not just simpler – more hygienic too

The ARC 350 display is made of flat, wipe-resistant, shatter- and scratch-proof safety glass. The benefit of this is that the touchpad technology eliminates joints and grooves, thereby ensuring rapid and hygienic cleaning in the OR.

A wealth of electrosurgical modes and effects

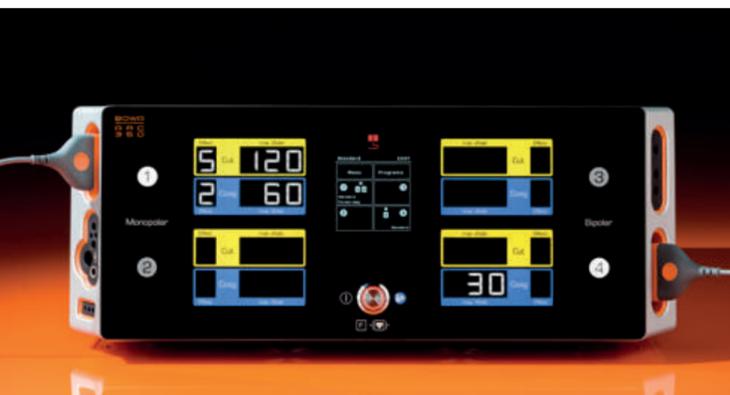
There are numerous standard modes available to the operator – each pre-set with the recommended power parameters. Moreover, the ARC 350 also offers indication-orientated modes that offer faster and simplified applications alongside the option of coordinating them specifically to your individual needs.

Application-orientated and individual device profiles

The base ARC 350 model offers a range of application-orientated profile settings. Use one of the settings as the starting point for your adaptation or save a profile to meet your own individual needs. You can save a total of 300 profiles.

Intelligent system concept for electrosurgery

The connection between the unit base and instrument is controlled and monitored by the use of RFID technology. The BOWA COMFORT system ensures the error-free use of instruments in conjunction with the ARC 350, however, the system can of course also be operated with conventional accessories and existing instruments.



100 % simplified – thanks to touch-assisted operation

The ARC 350 is simple and safe to operate. The menu opens up merely by tapping the setting to be changed on the display. Select the figure you require with the touch of your fingertip, assisted by

the information in the menu field. The active socket is highlighted by the socket number becoming illuminated, providing security and operating convenience.

Clarity: Every connected socket – in this photo the upper left and lower right – is clearly assigned to one quadrant of the display

Simple to use: Tap the corresponding field to activate the input menu in the centre of the ARC 350 to adjust effects or power values

The COMFORT SYSTEM – process reliability, quality assurance and monitoring

Our COMFORT SYSTEM relies on smart RFID technology – and thus on the new standard for electro-surgical accessories. The COMFORT SYSTEM is the first and optimum system worldwide for process optimisation in the OR – across all electro-surgical applications.

Every ARC 350 is equipped with the COMFORT System and thus with the standard of the future. Take advantage of intelligent COMFORT instruments and secure for yourself decisive benefits for your workflow in the OR.

Lean processes – more time for what's important

The COMFORT SYSTEM documents the use of the instruments in the instrument itself. The ARC 350 or the COMFORT BOX reads the information and, at a glance, identifies whether the instrument may still be used, thereby preventing the maximum number of uses being exceeded.

Maximum safety and simultaneous reduction of OR time

The Plug & Cut functionality of the COMFORT SYSTEM enables the generator to automatically identify the instrument, check it and select the correct device settings. The Plug & Cut COMFORT function thereby avoids incorrect settings.

Work efficiently – on a high-tech basis

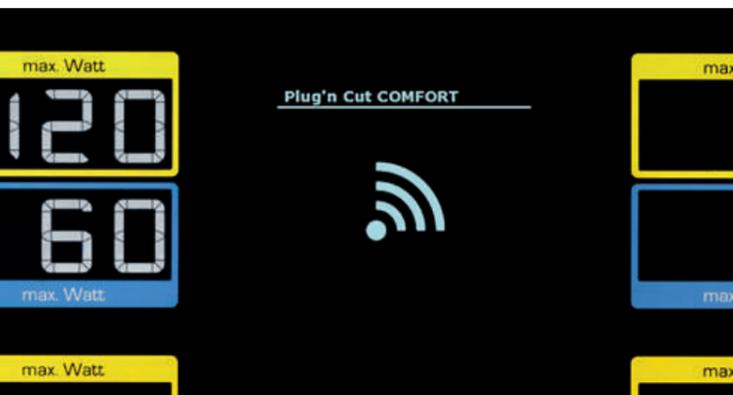
Passion is nothing – without the right technology

Excellent results depend on the right technology. In addition to the innovative socket design that allows up to two monopolar and two bipolar instruments to be attached simultaneously and is compatible with all popular standard connections, there are numerous hardware and software components that can also directly affect performance in the OR.

Monopolar simultaneous coagulation

With the ARC 350, monopolar simultaneous coagulation permits the simultaneous COAG activation of two monopolar handles for consistent tissue effects. This mode is especially ideal for coagulation and preparation, with the selected power setting being available for both handles. Applications include gynaecology with mastectomies, cardiac surgery with bypasses and surgery with multiple traumas.

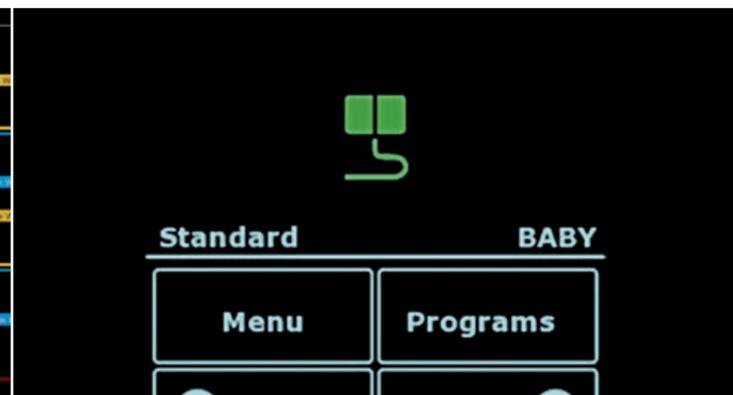
- ARC control arc regulation for reproducible monopolar and bipolar cutting results
- Up to 9 effects per mode
- EASY neutral electrode monitoring with contact monitor, baby mode with automatic power limitation
- Current leakage monitoring
- Short circuit detection
- ISSys permanent system self-testing
- CCS permanent initial cutting support
- Configurable socket design
- Information area for device messages
- CUT modes: e.g. standard, dry, cardiac, GastroCut loop and knife, MetraLOOP, laparoscopy
- Micro-regulations and power forms for plastic and neurosurgery down to 0.1 W
- COAG modes: moderate, forced, spray, cardiac
- Autostart function



Plug & Cut COMFORT: The COMFORT SYSTEM automatically recognises the COMFORT instrument, indicates how many times it may still be used and selects the correct parameters for the procedure



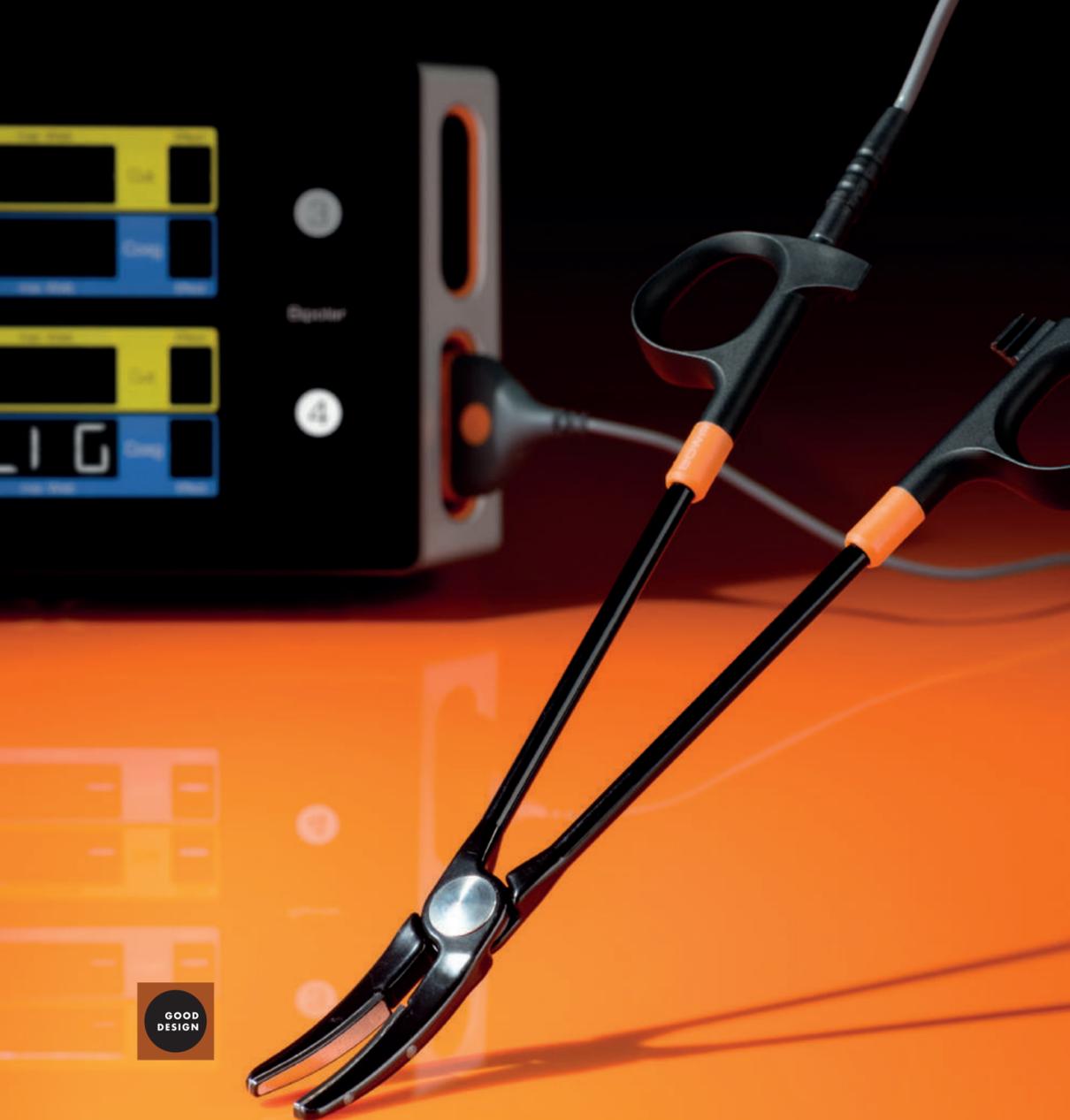
Plug & Cut: The ARC 350 automatically detects that a standard instrument is connected



The neutral electrode monitoring, shown here in the setting for babies (max. 50 watts), continuously informs users of the status



Efficient: Both handles can be activated simultaneously with monopolar coagulation



Costs and benefits – close the gap

ARC 350: the vessel sealing specialist

With the ARC 350 and BOWA LIGATION instruments, such as TissueSeal PLUS for open surgery applications and ERGO 315R also for laparoscopic applications, large-bore veins, arteries and tissue bundles with diameters of up to 7 mm can be sealed permanently and securely by bonding elastin and collagen to each other. The LIGATION sealing technique guarantees procedures free from residues and foreign bodies.

Optimum procedural results, thanks to outstanding ergonomics and tactility, are a further bonus for surgical artists. The massive potential for time-saving in the OR, as well as savings in terms of suturing materials and clips and instrument reusability, are all key features to convince even the strictest cost controller.

LIGATION is a fully automatic mode for the sealing of tissue with BOWA LIGATION instruments.



Surgical applications:

- Colectomy
- Gastrectomy
- Liver resection
- Thyroidectomy
- Lobectomy



Gynaecological applications:

- Hysterectomy – open and vaginal laparoscopic-assisted vaginal hysterectomy
- TLH: Total laparoscopic hysterectomy
- LASH: Laparoscopic supracervical hysterectomy
- Mastectomy



Urological applications:

- Prostatectomy
- Cystectomy
- Nephrectomy

ERGO 310D

- 340mm
- Ø 5 mm
- Disposable, sterile
- Packing unit of 5 pieces
- Integrated blade
- Plug & Cut COMFORT



NightKNIFE®

- 360 and 200mm
- Ø 10 mm
- Autoclavable
- Replaceable knife
- Plug & Cut COMFORT



ERGO 315R

- 275 and 360mm
- Ø 5 mm
- Autoclavable
- Disposable blade
- Plug & Cut COMFORT



TissueSeal® PLUS

- 160, 190, 230 and 280 mm
- Autoclavable
- Plug & Cut COMFORT



Literature:

Schuld J, Laschke MW, Rupertus K, Richter S, Menger MD, Schilling MK: Evaluationsstudie: BOWA NightKNIFE® vs. Ligasure Atlas™. BOWA, Gomaringen 2008

Schuld J, Richter S, Laschke MW, Sperling J, Menger MD, Schilling MK, Surgical Association for OR and Instrument Technology of the German Association for General and Visceral Surgery: Evaluationsstudie: BOWA TissueSeal® vs. Valleylab Ligasure™. BOWA, Gomaringen 2008

Schuld MD, Sperling MD, Kollmar MD, Menger MD, Schilling MD, Richter MD, Laschke MD: The Night KNIFE: Evaluation of Efficiency and Quality of Bipolar Vessel Sealing JOURNAL OF LAPAROENDOSCOPIC & ADVANCED SURGICAL TECHNIQUES 2011

GOOD DESIGN

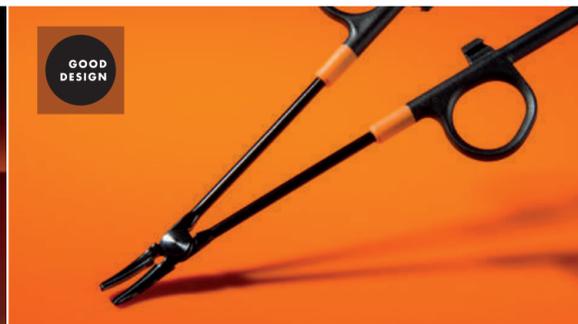
A join that conserves resources – LIGATION* with the ARC 350

Rely on an established technique for vessel and tissue sealing: LIGATION. Alongside the advantage of preventing the introduction of foreign bodies into the patient, this method also saves OR time, suture

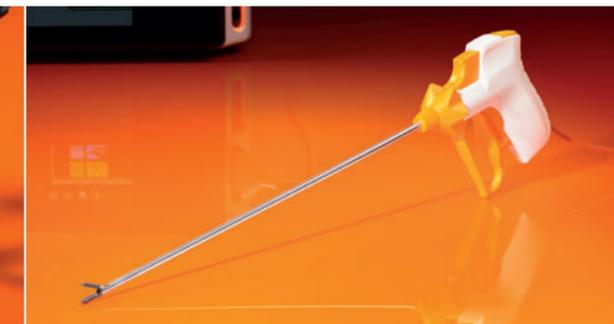
materials and clips. Autoclavable BOWA LIGATION instruments are the first choice for use with the ARC 350.



New: The LIGATION choice opens up new potential procedures and all settings are entered automatically



TissueSeal PLUS 160mm: re-usable sealing instrument with minimal thermal spread due to its sandwich structure



The 5 mm single-use sealing instrument ERGO 310D combined with the BOWA ARC 350 generator is the perfect system for laparoscopic procedures.



The ERGO 315R combines the advantages of a multifunctional instrument for laparoscopy with the added value of a reusable instrument.

* LIGATION is optionally available as a LIGATION package for the ARC 350



ARC PLUS – the ground-breaking addition with argon support

Contact-free. Reliable. Fast.

An electrical bridge is created between the instrument and the tissue in argon-assisted electro-surgery, with the aid of the ionisation of argon gas. The argon beam produced with ARC PLUS can be administered particularly well and can be used for contact-free haemostasis. Take advantage of enhanced clinical effectiveness for fast contact-free coagulation with maximum perforation safety and simple administration.

Technical features

- Automatic detection of argon instruments and parameter preselection by Plug & Cut
- Documentation of uses in the BOWA COMFORT instrument
- Automatic control by the ARC 350
- Electronic level indicator and pre-warning
- Flow rates of from 0.1 to 10l/min, max 2 bar outlet pressure
- Large coverage with 2 argon bottles
- Foot and manual operation
- Simple, space-saving docking of the ARC electro-surgery unit
- 2.0 to 4.5 bar input pressure
- Flow testing and pressure monitoring
- Extensive range of accessories

CUT

for argon-assisted cutting and coagulation with open and laparoscopic applications in surgery and gynaecology:

- Abdominal surgery
- Laparoscopy
- Liver surgery
- Mamma surgery
- Visceral surgery

Advantages of argon-assisted electro-surgery in surgery and gynaecology

- Contact-free coagulation without adherence or sticking in parenchymal tissues, such as the liver
- Fast coagulation of large surfaces
- Carbonisation-free
- Flexible coagulation zone
- Clear vision due to smoke-free coagulation
- Ultra-simple to operate with large ignition gap of > 10 mm and easy ignition

Applications (excerpts)

- Argon
- General surgery
- Liver surgery
- Abdominal plastic
- Transplant surgery
- ENT



Argon FLEX

for internal medical applications with flexible probes

Argon PULSED

with fine regulation across several effect stages

Advantages of argon-assisted electro-surgery in internal medicine

- Safe dosage with power and pulse sequence minimises the risk of perforation
- Particularly fine coagulation is possible from 1 W in gastroenterology
- Clear vision due to smoke-free coagulation
- Low-odour due to reduced smoke gases
- Carbonisation-free
- Flexible, long-lasting coagulation zone
- Ultra-simple to operate with large ignition gap of > 10 mm and easy ignition
- Minimal argon flow rates of 0.4l/min
- Limited penetration depth
- Perforation-free

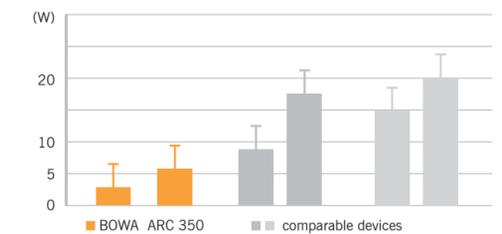
Applications (excerpts)

- Argon FLEX/Argon Flex 90
- Gastroenterology
 - Superficial and smaller vascular bleeds
 - Tumour reductions
 - Tumour bleeds
 - Devitalisation and overcoagulation, also in the right colon
 - Stent ingrowth/overgrowth
 - Radiation proctitis
- Interventional bronchology
 - Superficial and smaller vascular bleeds
 - Tumour reduction
 - Tumour bleeding
 - Recanalisation
 - Granulation
 - Fistula conditioning
 - Stent ingrowth/overgrowth
- Rectoscopy



Safety advantages and perforation safety with low power setting

Energy setting (W) for effective ignition or therapeutic effect



Literature:
Endo today 2007;
Prospective, randomised evaluation of low-energy argon plasma coagulation with endoscopic haemostasis of the gastrointestinal tract (GIT)
M. Raithel, J. Hänsler, A. Stegmaier, F. Boxberger, J. Maiss, W. Müller, E.G. Hahn
Med. Clinic I University of Erlangen-Nuremberg, Gastroenterology, Endoscopy, Funct. of Tissue Diagnostics; Conference Paper

ARC 350 and ARC PLUS – the all-purpose workstation for surgery and endoscopy

Argon-assisted electro-surgery offers contact-free work on large surfaces with diffuse bleeding and fine dosage on sensitive structures.

ARC 350 with ARC PLUS permits simple application thanks to reliable ignition and offers excellent perforation safety with low power settings.



The argon parameters are set directly on the ARC 350



A number of probes are available for the various argon-assisted applications

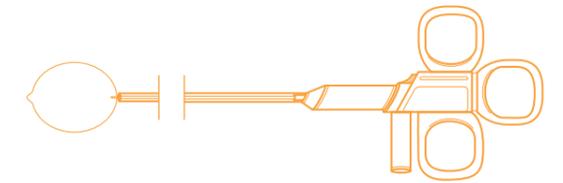
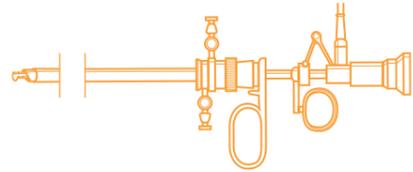


Activation of argon modes is also visualised on the ARC PLUS



The green display signals pre-flushing of the connected instruments with argon

Special applications – just four of many



Optional: Bipolar resection for urology
Bipolar resection with the ARC 350 stands out on account of its extremely reliable initial cutting and high resection speed.

Reduced irritation of the obturator nerve and bipolar technology hugely increase operating safety in this field. Using saline solution as a medium prevents the danger of TUR syndrome.

In addition, monopolar transurethral resection of the prostate (TUR-P), surgical treatment of bladder tumours (TUR-BT) and vaporisation of the prostate tissue (TUR-VAP) can also be carried out with the ARC 350.

Resection Cut & COAG

Special modes for the use of bipolar resectoscopes in gynaecology and urology

Quadruple specialities – functions for cardiac surgery

Four highly specialised functions for effective work are available for use in the field of cardiac surgery:

Monopolar SimCOAG for simultaneous coagulation and preparation with two monopolar handles

Cardiac thorax for forced coagulation when opening the thorax

Cardiac mammaia for forced coagulation in the area of the mammaries

Dry cutting for strong haemostasis

Gynaecology – clean removal with MetraLOOP
In addition to the modes for vessel sealing and monopolar and bipolar resection, a special function is available in gynaecology for laparoscopic supracerical removal of the uterus (LSH).

This mode – combined with the BOWA MetraLOOP instrument – offers more rapid cutting of the loop for uterus removal. Work can be accomplished safely, rapidly and precisely, even with large loops.

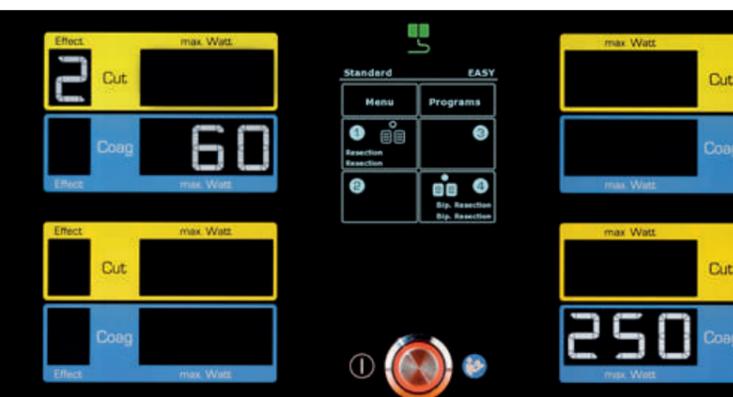
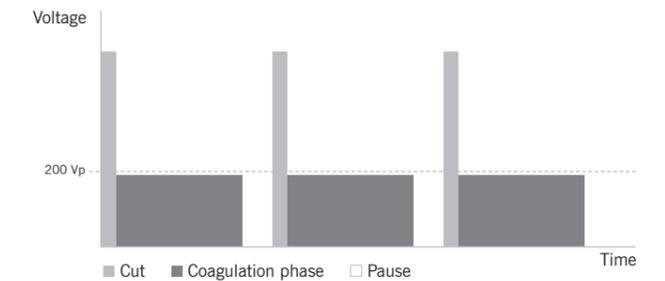
Gynaecology program
MetraLOOP

Optional: GastroCut for gastroenterology
With the ARC 350's GastroCut modes, gastroenterologists can achieve the best results with polypectomy and papillotomy and endoscopic resections with loops or knife electrodes.

Gastroenterologists can adjust the haemostasis level of cutting and coagulation power to three speeds "slow", "medium" and "fast" as required to meet their needs.

The cut is optimised, the surgeon controls the cut's coagulation effect through the effect in nine steps. This allows the surgeon to work cautiously to avoid complications, as well as proceeding rapidly when the situation allows it.

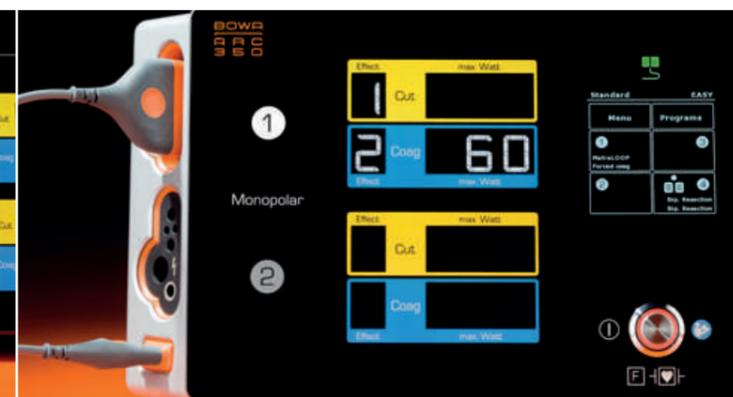
GastroCut power type



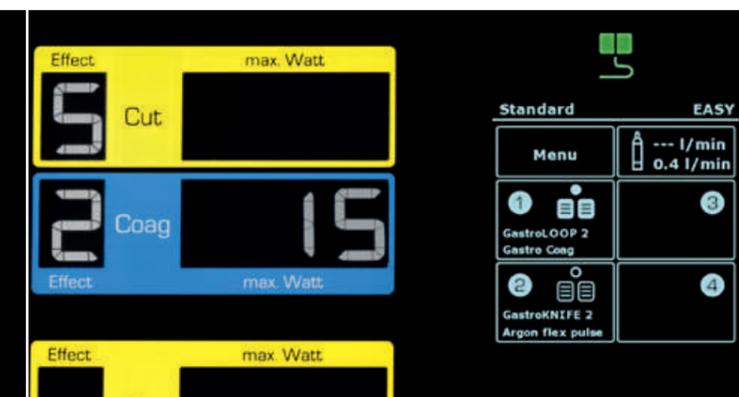
Innovation: Bipolar resection in urology with ultra-high resection speed



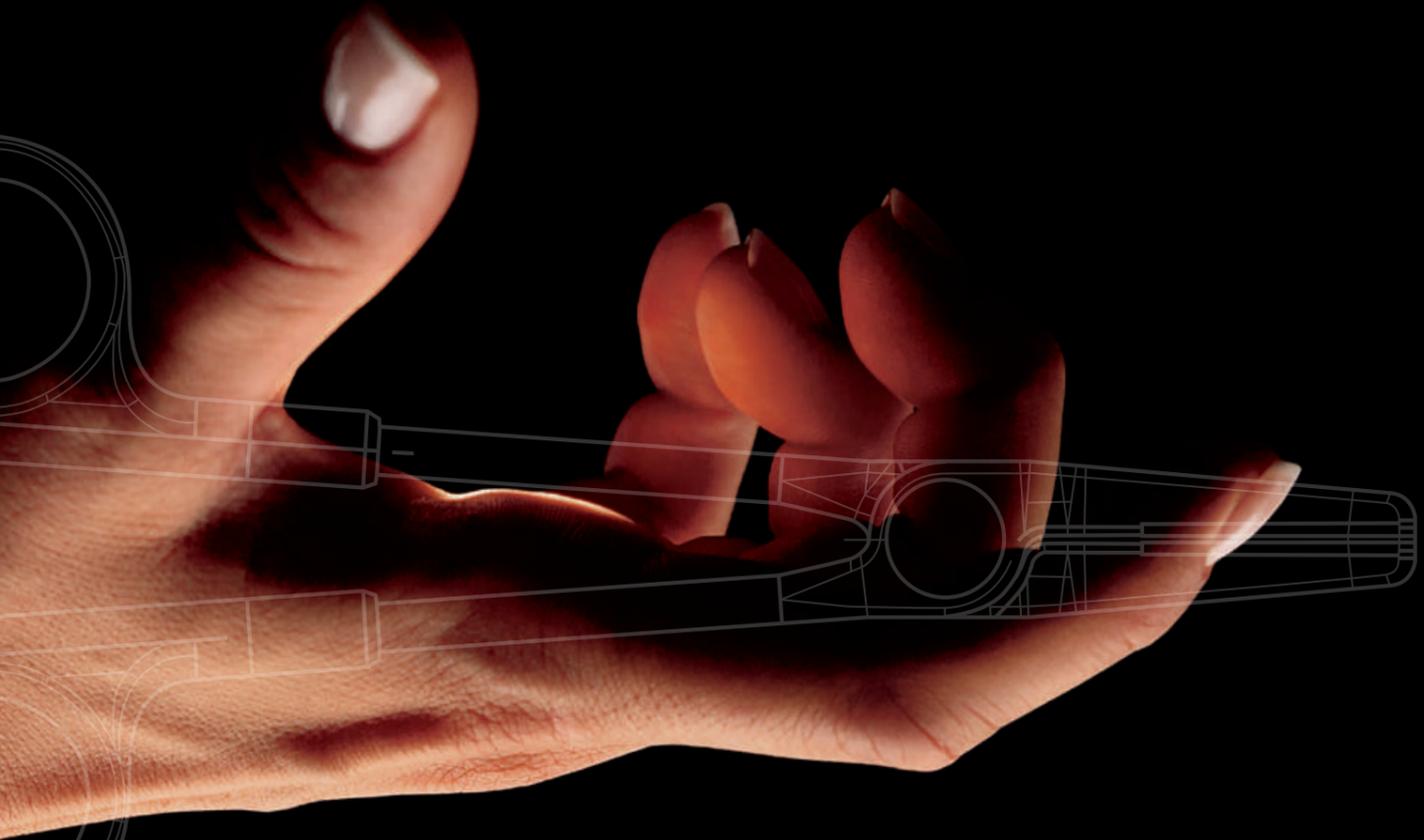
Supporting the division of work in cardiac surgery: simultaneous activation can be selected



Special effect for gynaecology: extremely fast and safe removal of the uterus using the MetraLOOP function



Highly flexible: GastroCut permits 6 cutting types with loops or knife electrodes for up to 9 effects



ARC CART – greater mobility

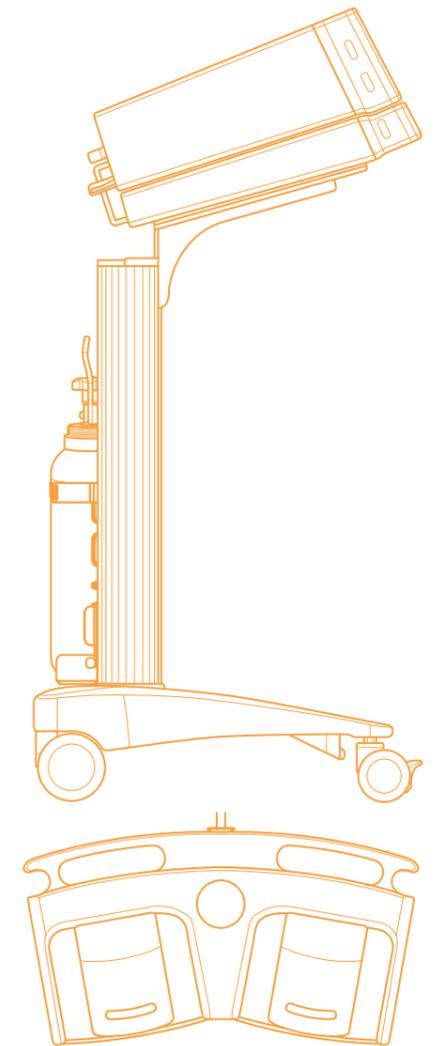
One unit – many options

The ARC 350, ARC PLUS and the ARC CART form a high-performance unit that can be quickly manoeuvred to wherever it is needed in the OR.

Everything is in the right place and can be individually configured in the ARC CART. The basic ARC CART offers four steerable rollers with brakes, cable conduit, power cable detachment prevention device, handle, foot switch holder and a cable holder. The storage shelf is optimised for the ARC generator.

Also available as accessories are shelves, for SHE SHA smoke evacuation systems, drawers, gas bottle holders, equipotential bonding connectors or baskets, thereby greatly increasing mobility.

The foot switches are waterproof (IPX8) and explosion-protected. Pedals are ergonomically arranged to allow for fatigue-free operation over long periods of time.



Accessories – more than the sum of their parts

The ARC 350 is the functional, efficient and modular upgradable generator solution that offers superior performance for all standard instrument families. When used in conjunction

with BOWA accessories, the ARC 350 becomes a closed system with outstanding properties – medical as well as economical.



Optimum: Vision and operation



Flexible: freely assignable foot pedals



Space-saving: streamlined design

Made by BOWA accessories – simply safe

"Simply safe" is more than just a promise. For us it is the commitment to always think beyond the current standards. This approach leads us to solutions that open up new perspectives and support you as best as possible in your work.

As a specialist HF surgical company, we offer you complete systems as well as complementary individual products.

For a comprehensive overview of our product range, visit us at www.bowa-medical.com.

ARC system and accessories



LOTUS



LIGATION – vessel sealing



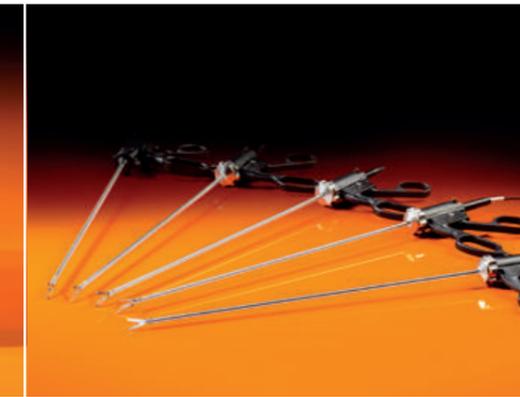
Argon-assisted electrosurgery



SHE SHA smoke evacuation



Instruments for laparoscopy



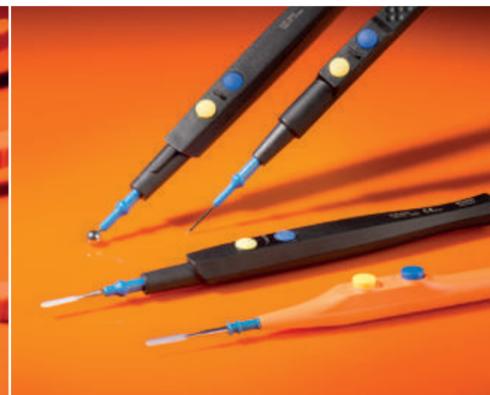
BiZZER® – bipolar scissors



Forceps



Handles and electrodes



Cables and adapters



Neutral electrodes



Sets



Made in Germany – technical information

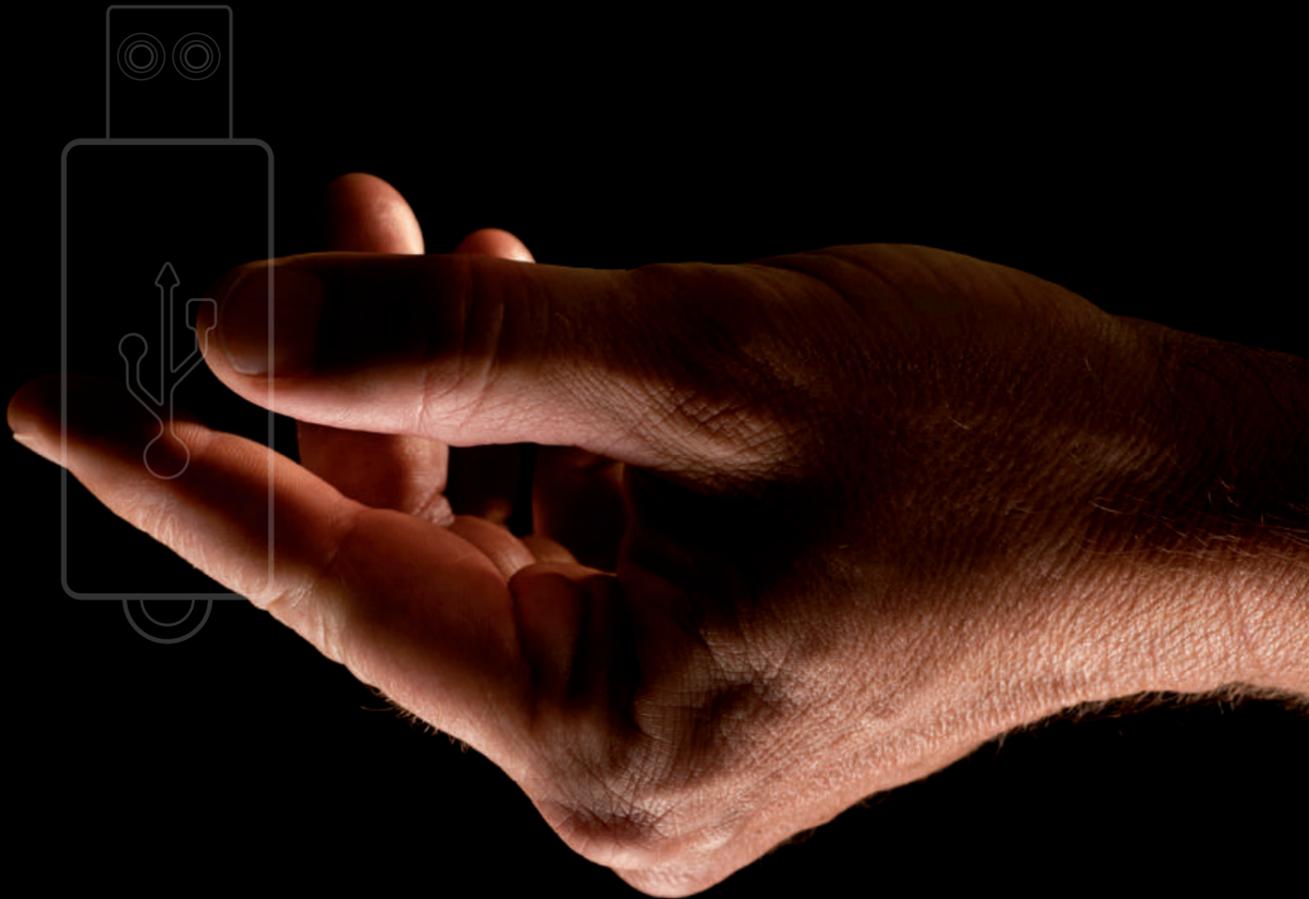
BOWA ARC 350 is designed for use in almost all areas of electrosurgery. ARC generators can be placed on ceiling supply units or on the ARC CART for unrestricted mobility. The device has two monopolar and two bipolar outputs. Hospital technicians can perform simple maintenance work,

such as reading off unit information or running software updates that are supplied on a USB stick. Should you wish to connect third-party accessories, this is also possible using a range of different sockets.

| Technical data at a glance | ARC 350 | ARC PLUS |
|---|--|-----------------------------|
| Mains voltage | 100–127 V/220–240 V | 100–240 V |
| Line frequency | 50/60 Hz | 50/60 Hz |
| Max. current consumption | Max. 5 A @ 240 V | 10 A @ 100 V 8 A @ 127 V |
| Mains fuse | 2 x 5 AH slow blow/ 2 x 10 AH slow blow | 2 x 1 A slow blow |
| Power consumption in standby mode | 3 W/40 VA | 5 W/25 VA |
| Power consumption at max. | 700 W/1150 VA | 32 W/65 VA |
| Width x Height x Depth | 430 x 180 x 475 mm | 433 x 97 x 489 mm |
| Weight | 12.5 kg | 7.7 kg |
| Classification under EC Directive 93/42/EEC | II b | II a |
| Protection class according to EN 60601-1 | I | I |
| Type according to EN 60601-1 | CF | - |
| CE marking | CE0123 | CE0123 |
| Item no. | 900-351 | 900-001 |
| GastroCut incl. COMFORT | 900-391 | - |
| Bipolar resection incl. COMFORT | 900-395 | - |
| LIGATION incl. COMFORT | 900-396 | - |
| Max. MONOPOLAR power | 400 W (at 100 Ω) | - |
| Max. BIPOLAR power | 400 W (at 75 Ω) | - |
| Output frequency | 350 kHz/1 MHz | - |

Your choice – configuration of sockets

| | monopolar | bipolar |
|---------------|-----------------|----------------|
| International | 2 x 3-pin/Bovie | 2 x 2-pin |
| Europe | 2 x 3-pin/Erbe | 2 x 2-pin/Erbe |



Update service – simply by USB

Take advantage of the latest developments of the future. The ARC 350 is ready and waiting. Use our Update Service to update your ARC 350 software, such as new programs for standard procedures,

simply via a USB stick. The many standard sockets guarantee the future-proofing of your unit and its automated integration into your system landscape – even in the future.



Clear design: compact design, ideal to meet the exacting hygiene conditions in your OR



Communicative interfaces: with USB and network socket – designed for today and tomorrow

BOWA
EINFACH SICHER

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72810 Gomaringen | Germany

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Fax +49 (0) 7072-6002-33
info@bowa.de | bowa-medical.com



900-351 Electrosurgical unit ARC 350



Intended use

The HF unit is exclusively designed to generate electric power for monopolar and bipolar cutting and coagulation of tissue in surgical procedures.

Technical specifications

| | |
|--|--|
| Insulation type / Classification | |
| EMC | IEC 60601-1-2 |
| Level of protection provided by the housing | IP 21 |
| Protection class according to EN 60601-1 | I |
| Application component type according to EN 60601-1 | CF |
| Standards compliance | IEC 60601-1: 2005, IEC 60601-1-2:2007, IEC 60601-2-2: 2009, ISO 14971: 2007 ISO 13485: 2003 + Cor.1 2009 |
| Classification according to EC Directive 93/42/EEC | IIb |

| | | |
|-------------------------------------|--------------------------------------|----------------------------|
| Power connection | (220 V – 240 V) | (110 V – 115 V) |
| Input voltage | 100 – 120 V / 220 – 240 V (+/- 10 %) | |
| Input voltage range | 198 V - 264 V | 90 V – 130 V |
| Mains frequency | 50 / 60 Hz | |
| Power consumption in standby mode | 3 W / 40 VA | |
| Current consumption in standby mode | 200 mA | 400 mA |
| Maximum power consumption | (at 350 W) 700 W / 1150 VA | (at 350 W) 700 W / 1150 VA |
| Maximum current consumption | (at 350 W) 5 A | (at 350 W) 10 A |
| Line fuses | 2 x 5 A slow-blow | 2 x 10 A slow-blow |
| Terminal for potential equalization | Yes | |

| Dimensions and weight | |
|-----------------------------------|---------------------------|
| Dimensions | 430 x 180 x 475 mm |
| Net weight | 12,5 kg |
| Packaging information /dimensions | Carton 685 x 497 x 280 mm |
| Gross weight | 18 kg |

| Programs | |
|----------------------------------|-----|
| Number of programs in the device | 350 |
| Default programs, factory set | Yes |
| Individually programmable | Yes |
| Information shown on the display | Yes |

| Neutral electrode monitoring | |
|---|--|
| EASY (Electrode Application System) | Yes |
| Display indication of one-piece or split or Baby electrode | Main and neutral electrode menu |
| Contact resistance between individual sections of split neutral electrodes shown on display | Using colour and contact indicator |
| Lead resistance shown on the display when a non-split neutral electrode is used | Yes |
| Maximum allowable resistance between the sections of a split electrode | 300 Ω |
| Warning signal for hazardous conditions concerning neutral electrode | Visual, acoustic |
| Tones | Warning, activation, key, starting sound |
| Warning message on the display | Text message with further information |

| Safety features | |
|--|---------------------------------------|
| ISSys (Integrated Safety System) | Yes |
| Spark regulation | ARC CONTROL |
| Continuous monitoring of HF leakage current and fault indication | Text message with further information |
| Dosage monitoring with fault indication on the display | Yes |
| Continuous self-test | Yes |
| Continuous status indication on the display | Yes |
| Operating errors shown on the display | Text message with further information |
| System faults shown on the display | Text message with further information |
| Technical Safety Inspection (TSI) | Automatic memory function (optional) |
| Operating manual | Paper, USB-Stick incl. PDF |

| Documentation | |
|---|---------------------------------------|
| Data acquisition and storage in the device | System information |
| Documentation of fault states | Yes |
| Documentation of operating errors | Yes |
| Retrieval of system information via the display | Text message with further information |

| Communication | |
|---|---|
| Display | Capacitive touchscreen 3,5" TFT display, 4 LCD displays, 7 PCT keys |
| External interface for communication of HF generator and ARC PLUS | Light wire cables |
| USB interface for software updates | Yes |
| External PC interface for service support using BOWA software | CAN / UART |

| Service support | |
|--|-----|
| Network port for service support | Yes |
| Service support by service programs integrated in the device | Yes |
| Service support via ISSys | Yes |

| Cooling | |
|----------------------------|-----|
| Convection | Yes |
| Temperature-controlled fan | Yes |

| Duty factor | |
|-------------|-------------------------------------|
| Duty factor | Intermittent 10 s / 30 s (on / off) |

| Characteristics | |
|---------------------------|--|
| Max. CUT power | 350 W (at 500 Ω) |
| Max. COAG power | 350 W (at 25 Ω) |
| Output frequency | 350 kHz / 1 MHz |
| Monopolar sockets | 2x (footswitch and finger switch) |
| Bipolar sockets | 2x (footswitch and finger switch) |
| Connection for footswitch | 2x |
| AUTOSTART | Yes |
| Options | Bipolar Resection M098-900395, LIGATION M098-900396, GastroCut M098-900391 |
| Indication | Options incl. Plug'n Cut COMFORT instrument identification |
| Scope of delivery | Incl. operating manual, mains cable, PE-line |

| Compatibility | |
|------------------------|--|
| Permitted combinations | ARC PLUS (900-001), footswitch (901-031, 901-032, 901-011) |

| Conditions of operation, transport and storage | Operation | Transport and storage |
|--|---------------------------|--------------------------|
| Temperature | +10°C to +40°C | -20°C to +50°C |
| Relative humidity | 30 to 75%, non-condensing | 0 to 90%, non-condensing |
| Atmospheric pressure | 700 to 1060 hPa | 500 to 1060 hPa |
| Operating altitude (max.) | 4000 m above sea level | |

Current types

| Description | CCS | ARC CONTROL | Form of HF voltage | Max. power output | | Peak voltage | Default values | |
|--------------------------------|-----|-------------|--|---|-------------------------|---|----------------|-----------|
| | | | | Effect | Power range | | Effect | Max. Watt |
| Monopolar Modes Cutting | | | | | | | | |
| Standard | Yes | Yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 350 W | 400 Vp 450 Vp 560 Vp 650 Vp 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 5 | 100 |
| Micro | Yes | Yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 50 W | 280 Vp 340 Vp 380 Vp 400 Vp 400 Vp 400 Vp 450 Vp 450 Vp 450 Vp | 5 | 20 |
| Dry | Yes | Yes | sinusoidal modulated | 1 2 3 4 5 6 7 8 9 | 1 W - 200 W | 1,4 kVp 1,4 kVp 1,4 kVp 1,4 kVp 1,5 kVp 1,6 kVp 1,6 kVp 1,6 kVp 1,6 kVp | 5 | 100 |
| Argon | Yes | Yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 300 W | 400 Vp 450 Vp 560 Vp 650 Vp 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 5 | 100 |
| Resection | Yes | Yes | sinusoidal constant | 1 2 3 4 5 | 250 W | 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 2 | --- |
| MetraLOOP | Yes | Yes | sinusoidal constant | 1 2 3 | 100 W 150 W 200 W | 650 Vp | 1 | --- |
| Laparoscopy | Yes | Yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 200W | 400 Vp 450 Vp 560 Vp 650 Vp 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 5 | 100 |
| GastroLOOP 1 | Yes | Yes | Sinusoidal alternating Coag, Cut and break phases | 1 2 3 4 5 6 7 8 9 | - | 750 Vp | 5 | --- |
| GastroLOOP 2 | Yes | Yes | Sinusoidal alternating Coag, Cut and break phases | 1 2 3 4 5 6 7 8 9 | - | 750 Vp | 5 | --- |
| GastroLOOP 3 | Yes | Yes | Sinusoidal alternating Coag, Cut and break phases | 1 2 3 4 5 6 7 8 9 | - | 750 Vp | 5 | --- |

| Description | CCS | ARC CONTROL | Form of HF voltage | Max. power output | | Peak voltage | Default values | |
|------------------------------------|-----|-------------|--|---|-------------|--|----------------|-----------|
| | | | | Effect | Power range | | Effect | Max. Watt |
| Monopolar Modes Cutting | | | | | | | | |
| GastroKNIFE 1 | Yes | Yes | Sinusoidal alternating Coag and Cut phases | 1 2 3 4 5 6 7 8 9 | - | 650 Vp | 5 | --- |
| GastroKNIFE 2 | Yes | Yes | Sinusoidal alternating Coag and Cut phases | 1 2 3 4 5 6 7 8 9 | - | 650 Vp | 5 | --- |
| GastroKNIFE 3 | Yes | Yes | Sinusoidal alternating Coag and Cut phases | 1 2 3 4 5 6 7 8 9 | - | 650 Vp | 5 | --- |
| Monopolar Modes Coagulation | | | | | | | | |
| Moderate | | | sinusoidal constant | 1 2 3 | 1 W - 120 W | 250 Vp | 2 | 60 |
| Forced coag | | | pulsed modulated | - | 1 W - 80 W | 3,5 kVp | --- | 50 |
| Forced mixed | | | sinusoidal modulated | 1 2 3 | 1 W - 120 W | 2,3 kVp 2,5 kVp 2,8 kVp | 2 | 60 |
| Forced cutting | | | sinusoidal modulated | 1 2 3 4 | 1 W - 250 W | 1,5 kVp 1,5 kVp 1,3 kVp 1,3 kVp | 2 | 80 |
| Spray | | | pulsed modulated | 1 2 3 4 | 1 W - 120 W | 3,0 kVp 3,8 kVp 4,6 kVp 5,0 kVp | 2 | 80 |
| Argon open | | | pulsed modulated | - | 1 W - 120 W | 4,6 kVp | --- | 80 |
| Argon flexible | | | pulsed modulated | - | 1 W - 120 W | 4,4 kVp | --- | 40 |
| Argon flex. pulse | | | pulsed modulated | 1 2 3 | 1 W - 80 W | 4,4 kVp | 2 | 20 |
| Resection | | | sinusoidal modulated | - | 1 W - 120 W | 2,6 kVp | --- | 60 |
| Cardiac Mammary | | | sinusoidal modulated | - | 1 W - 60 W | 2,3 kVp | --- | 15 |
| Cardiac Thorax | | | sinusoidal modulated | - | 1 W - 100 W | 2,3 kVp | --- | 40 |
| SimCoag | | | sinusoidal modulated pulsed modulated pulsed modulated | 1 2 3 | 1 W - 120 W | 1,5 kVp 2,3 kVp 4,6 kVp | 2 | 60 |

| Description | CCS | ARC CONTROL | Form of HF voltage | Max. power output | | Peak voltage | Default values | |
|------------------------------------|-----|-------------|----------------------|-------------------|--------------|-------------------------------|----------------|-----------|
| | | | | Effect | Power range | | Effect | Max. Watt |
| Monopolar Modes Coagulation | | | | | | | | |
| Gastro Coag | | | sinusoidal modulated | 1 2 3 | 1 W - 50 W | 2,3 kVp 2,6 kVp 3,1 kVp | 2 | 15 |
| Laparoscopy | | | sinusoidal modulated | - | 1 W - 120 W | 1,8 kVp | --- | 60 |
| Bipolar Modes Cutting | | | | | | | | |
| Standard | Yes | Yes | sinusoidal constant | - | 1 W - 200 W | 400 Vp | --- | 100 |
| Bipolar Resection | Yes | Yes | sinusoidal constant | 1 2 3 | 250 W | 500 Vp | 2 | --- |
| Bipolar Scissors | | | sinusoidal constant | - | 1 W - 120 W | 200 Vp | --- | 40 |
| Bipolar Modes Coagulation | | | | | | | | |
| Forceps Standard | | | sinusoidal constant | - | 1 W - 120 W | 150 Vp | --- | 40 |
| Forceps Standard AUTOSTART | | | sinusoidal constant | - | 5 W - 120 W | 150 Vp | --- | 40 |
| Forceps Micro | | | sinusoidal constant | - | 0.1 W - 20 W | 150 Vp | --- | 10 |
| Forceps Forced | | | sinusoidal modulated | - | 1 W - 100 W | 550 Vp | --- | 70 |
| LIGATION | | | sinusoidal modulated | - | 200 W | 190 Vp | --- | --- |
| TissueSeal PLUS | | | sinusoidal modulated | - | 200 W | 190 Vp | --- | --- |
| Bipolar Scissors | | | sinusoidal constant | - | 1 W - 120 W | 200 Vp | --- | 40 |
| Laparoscopy | | | sinusoidal constant | - | 1 W - 120 W | 150 Vp | --- | 50 |
| Bipolar Resection | | | sinusoidal constant | - | 1 W - 350 W | 190 Vp | --- | 200 |

| | | | | | | | | |
|--------------|----------------------|-------------|-------------|--|------------|--------|----------------------|-----------|
| | | | | Prep. | Date | Name | M098-900351 | |
| | | | | TE | 24.02.2014 | Müller | | |
| | | | | TL | | | | |
| | | | | PM | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Index | No. of Change | Date | Name | BOWA <small>EINFACH SICHER</small> BOWA-elektronik GmbH & Co. KG Heinrich-Hertz-Strasse 4-10 72810 Gomaringen Telefon +49 (0) 7072 6002 0 Telefax +49 (0) 7072 8719 | | | Specification | EN |

OPERATING MANUAL ELECTROSURGICAL UNIT



BOWA
ARCO
350

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1. Using this operating manual

This operating manual is part of the device.

BOWA-electronic GmbH & Co. KG, referred to in the following simply as BOWA, assume no liability nor provide any warranty whatsoever for damage and consequential damages that arise due to non-compliance with the operating manual.

- ▶ Read the operating manual carefully and thoroughly before using this device.
- ▶ Store the operating manual in a safe place throughout the service life of the device.
- ▶ Keep the operating manual accessible to operating room personnel.
- ▶ Give the operating manual to each successive owner and/or user of this device.
- ▶ Always update the operating manual whenever you receive additional information from the manufacturer.

1.1. Revision index

| Unit version | Last revised |
|--------------------------|--------------|
| Valid from version 2.0.0 | 2014/02 |

1.2. Validity

This operating manual applies only to the devices designated on the title page.

1.3. Other applicable documents

- ▶ Comply with other applicable documents in the appendix or in the other sections.

1.4. Icons and labeling

1.4.1. Structure of warning instructions



SIGNAL WORD

"Risk type, source and consequences there of" (Personal injury)!

- ▶ Measure for risk prevention.
-



NOTE

"Risk type, source and consequences there of" (Property damage)!

- ▶ Measure.
-

1.4.2. Risk levels in warning instructions

| Symbol | Risk level | Probability of occurrence | Consequences of non-compliance |
|---|----------------|---------------------------|--------------------------------|
|  | DANGER | Immediate risk | Death, serious injuries |
|  | WARNING | Possible risk | Death, serious injuries |
|  | CAUTION | Possible risk | Minor injuries |
|  | NOTE | Possible risk | Property damage |

1.4.3. Tips



Tips and additional information to facilitate tasks

1.4.4. Other symbols and marks

| Symbol or mark | Meaning |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Prerequisite for an activity |
| ▶ | Activity with one step |
| 1. 2. 3. | Activity with several steps in a binding sequence |
| ↪ | Result of preceding activity |
| • | List (first level) |
| • | List (second level) |
| Emphasis | Emphasis |
|, see Section xxx, page xxx | Cross reference |

2. Safety

2.1. Intended use

The HF device is intended exclusively for the generation of electrical power for monopolar and bipolar cutting and coagulation on tissue structures in surgical operations.

It is used in the following areas:

- General surgery
- Endoscopy (GastroCut mode)
- Gynecology
- Hand surgery
- ENT
- Cardiac surgery (including open-heart surgery)
- Neurosurgery
- Paediatric surgery
- Plastic surgery and dermatology
- Thoracic surgery
- Orthopedics
- Urology, including transurethral resection (TUR)

Do not use the HF device if, in the opinion of an experienced physician or according to current professional literature, such use would endanger the patient, due for example to the general condition of the patient, or if other contraindications are present.



BOWA requires that the HF device is operated under the supervision of qualified and authorized personnel. The surgeon and medical staff must be trained in the fundamental principles, rules for use and risks of HF surgery and must be familiar with these in order to safely and reliably prevent putting patients, staff and equipment at risk. Contact your BOWA distributor for trainings and training material.



Any other use is neither intended nor proper and must be effectively prevented.

2.2. General safety instructions

- ▶ Ensure that no electronic devices that are subject to interference from electromagnetic fields are set up in the vicinity of the HF device.
- ▶ Observe the instructions on electromagnetic compatibility provided in section EMC, page 120.
- ▶ Always connect the HF device to a mains power system with a protective earth lead in order to prevent electric shock.

Additional devices that are connected to electrical medical devices must satisfy relevant IEC or ISO standards (e.g. IEC 60950 for data processing devices). Furthermore, all configurations must comply with the standardised requirements for medical systems (see IEC 60601-1-1 or Section 16 of the 3rd edition of IEC 60601-1 as relevant). Anyone who connects additional devices to electrical medical devices is automatically a system configurator and thus responsible for meeting standardised system requirements. Please note that local laws prevail over the aforementioned standard requirements. In case of questions, please contact your local dealer or Technical Service, see section Technical service, page 73.

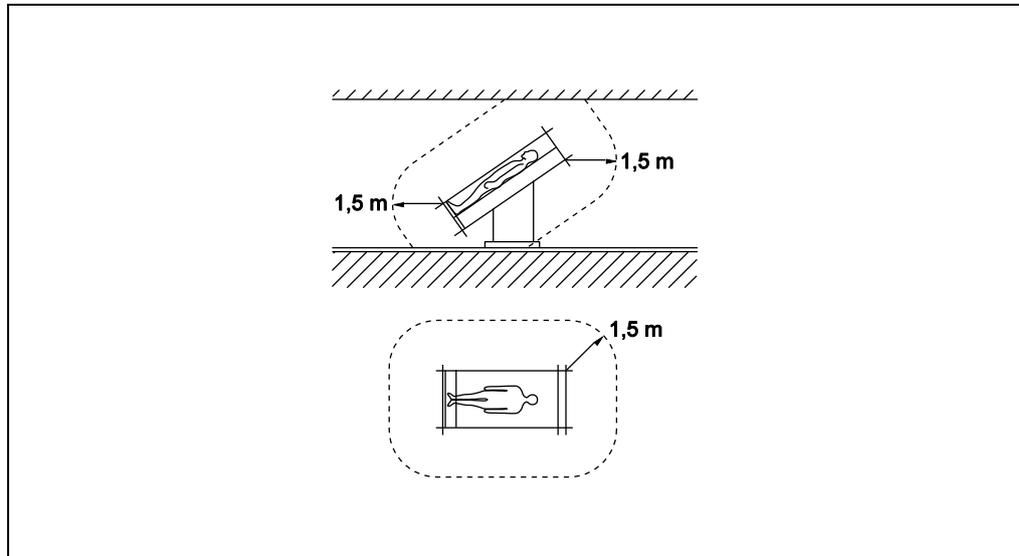


To protect personnel, BOWA recommends the use of a smoke evacuator to extract electrosurgical smoke, e.g. BOWA SHE SHA.

2.3. Personal safety instructions

2.3.1. Ambient conditions

- ▶ Do not use the HF device in the immediate vicinity of the patient. Observe the minimum distances recommended by BOWA, as shown in the following figure.



2.3.2. Patients with pacemakers

Malfunction or destruction of the pacemaker can endanger the life of the patient or result in irreversible injuries to the patient.

- ▶ In the case of patients with pacemakers, consult the cardiologist before carrying out HF surgery.
- ▶ Use bipolar HF methods.
- ▶ Attach the HF neutral electrode close to the operating field.
- ▶ Set the demand pacemaker to a fixed frequency.
- ▶ Ensure that the pacemaker does not come into contact with the HF electrode.
- ▶ Keep a fully operational defibrillator within reach.
- ▶ Carry out a postoperative pacemaker check.

2.3.3. Hazard-free patient positioning

- ▶ Position patients so that they are not touching any metal parts that are grounded or have considerable capacitance relative to ground (e.g. operating table brackets). If necessary, place anti-static cloths between the patient and the bedding.
- ▶ Ensure that the patient does not touch any wet clothes or bedding.
- ▶ Place anti-static cloths between areas with heavy sweating and skin-to-skin contact areas on the patient's torso.
- ▶ Ensure that the patient is resting on a suitable surface in order to prevent pressure necrosis.
- ▶ Drain urine via a catheter.

2.3.4. Correct connection of the HF device

- ▶ Always ground the HF device to the equipotential rail. Also observe the requirements in Section 8.6.7 of IEC 60601-1 regarding medical electrical systems.
- ▶ Do not use needle electrodes for monitoring.
- ▶ Attach electrodes of physiological monitoring devices without protective resistors or HF chokes as far away from the HF electrodes as possible.
- ▶ Place lines from monitoring devices so that they do not lie on the patient's skin.
- ▶ Keep the leads to the HF electrodes as short as possible and position them so that they do not touch the patient or other leads.
- ▶ Do not place any objects on the HF device.

2.3.5. Correct use of the HF device

Inadvertent activation of the HF device outside the user's field of vision can injure the patient.

- ▶ Activate the HF device only when the electrode is in your field of vision and you can quickly deactivate the HF device at all times.
- ▶ If the HF device is activated inadvertently, switch it off immediately using the on/off switch.
- ▶ Take particular care when using a foot switch or manual switch.

Improper preparation, user errors or faults in the HF device can cause damage to the HF device.

- ▶ Use the automatic monitoring functions to ensure that the HF device is working properly. See Section Functional testing, page 26 for information on the auto test functions.
- ▶ Ensure that no conductive fluids (e.g. blood or amniotic fluid) have penetrated the foot switch or the manual switch.
- ▶ Ensure that the cables for the foot switch and the manual switch are free from short circuits and broken leads.

2.3.6. Configuring HF device settings and using accessories

Setting the output power too high can injure the patient. Therefore, before you increase the output power, ensure that:

- the neutral electrode is attached properly;
- the working electrodes are clean;
- the plug connections are all correct.

Setting the HF device correctly

- ▶ To prevent inadvertent (thermal) tissue damage during operations on body parts with small cross sections and in areas with high resistance (bones or joints), use the bipolar method in these areas.
- ▶ Set the level of the acoustic signal that sounds when the electrode is activated so that it is always clearly audible.

Risk of nerve or muscle excitation by low-frequency currents.

During HF surgical operations (especially when an arc is formed), part of the HF current is converted into a low-frequency current. This current can trigger muscle contractions in the patient.

- ▶ To minimize the risk of injury to the patient, set the power and the effect as low as possible.

Correct use of accessories

- ▶ Use only insulated accessories.
- ▶ Check all electrodes for sharp edges and projecting parts before use.
- ▶ Use only electrodes that are free of defects and in good working order.
- ▶ Never place active electrodes on or near the patient.
- ▶ Do not remove hot electrodes from the patient's body directly after cutting or coagulation.
- ▶ Ensure that there is sufficient distance between the patient cables and the cables of the HF device.
- ▶ Do not run the patient cable across the patient.

2.4. Product-related safety instructions

Devices manufactured by BOWA are developed in accordance with the current state of technology and generally accepted safety rules. Despite this, using these products can lead to risks to the life and health of the user or third parties and/or damage to the device or other objects.

- ▶ Use only accessories approved by BOWA, see Section Accessories and replacement parts, page 119.
- ▶ Use the device only when it is in free of technical defects and in good working order and only for the intended purpose, always remaining aware of safety requirements and risks and complying with this operating manual.
- ▶ Have malfunctions that can adversely affect safety (e.g. deviations from the permissible operating conditions) repaired without delay.
- ▶ Wipe down the HF device only with cleaning agents and disinfectants that are approved in the country of use for surface cleaning. See Section Disinfection and cleaning, page 70.
- ▶ Never immerse the device in water or cleaning agents.
- ▶ Never boil the device and never disinfect it mechanically.
- ▶ If any fluids penetrate the device, drain them immediately.

Damage to the device can lead to an undesirable increase in output power due to improper operation of the device.

Certain units or accessories can cause danger in lower power settings. For example, the risk of gas embolism in argon assisted coagulation rises, if the hf-power is insufficient for the fast creation of an impenetrable eschar layer on the target tissue.

2.5. Safe handling (general instructions)

- ▶ Before each use of the device, check to ensure that it is functioning properly and is in good working order and connected properly.
- ▶ Observe the instructions on intended use in conformance with standards (see Section Fault indications for EASY monitoring , page 69).
- ▶ During use, always observe and comply with the acoustic signals and/or error messages of the HF device (see Section Fault indications for EASY monitoring , page 69).
- ▶ The device and accessories may be operated and used only by people who have the necessary training, knowledge and experience.
- ▶ Regularly inspect the accessories, especially the electrode cables, endoscopic accessories and neutral electrodes, for damage to the insulation, proper operation and expiration date.
- ▶ Ensure that no instruments are being cleaned when AUTOSTART is activated.
- ▶ Wear suitable gloves during operations.

2.5.1. Operation area: avoiding ignition and explosions

Sparks are generated when the HF device is used as intended.

- ▶ Do not use the HF device in areas where there is a risk of explosion.
- ▶ Do not use any flammable or explosive liquids.
- ▶ If the display fails, do not use the HF device any longer.
- ▶ During operations (e.g. in the head or thoracic regions), avoid using ignitable anesthetics and gases that support combustion (e.g. nitrous oxide or oxygen) or extract them using a vacuum system.
- ▶ Use exclusively non-flammable cleaning agents, disinfectants and solvents (for adhesives). If you use flammable cleaning agents, disinfectants or solvents, ensure that they have fully evaporated before using HF surgical equipment.
- ▶ Ensure that no flammable liquids collect beneath the patient or in body cavities (e.g. the vagina). Suction and/or flush body cavities before activating the device.
- ▶ Wipe off all liquids before using the HF device.
- ▶ Ensure that no ignitable endogenous gases are present.
- ▶ Ensure that all materials saturated with oxygen (e.g. cotton or gauze) are kept far enough away from the HF environment that they cannot ignite.

2.5.2. Applying the neutral electrode

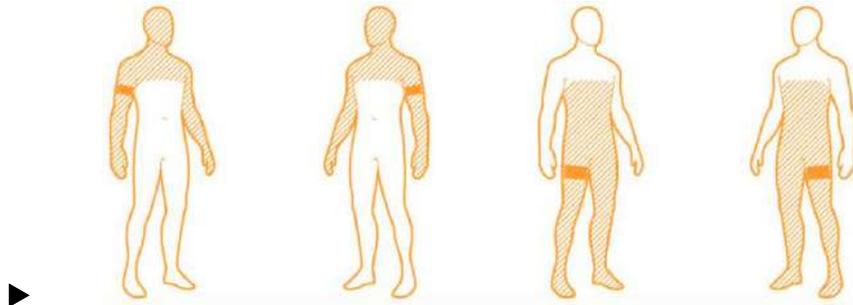


Observe the instructions on the use of the neutral electrode in the user guide and the information on the package of the neutral electrode.

In the monopolar HF method, the neutral electrode feeds the current introduced into the patient's body at the surgical site back to the HF device.

- ▶ To prevent a rise in temperature at the current exit point, the following conditions must be ensured:
 - sufficiently large contact surface between the neutral electrode and the patient's body;
 - high electrical conductivity between the neutral electrode and the patient's body.

- ▶ To prevent the patient being burned by the neutral electrode, you must comply with the following conditions:
 - Select the application point for the neutral electrode so that the current paths between the active and neutral electrodes are as short as possible and run longitudinally or diagonally through the patient's body (because muscles are more conductive in the direction of the fibrils).



▶ *Figure 2-1: Application point of neutral electrode*

- For surgery in the thoracic region, do not run the current path transversely across the patient's body and ensure that the patient's heart is never in the current path.
- Depending on the surgical site, apply the neutral electrode to the nearest upper arm or thigh if possible, but never closer than 20 cm.
- In the case of self-adhesive disposable electrodes, comply with any further manufacturer instructions regarding the point of application.
- Ensure that the application area is free of scar tissue, bony protuberances, surface hair and ECG electrodes.
- Ensure that there are no implants (e.g. bone nails, bone plates or endoprotheses) in the current path.
- Ensure that no short circuits can occur at the neutral electrode connection.
- Avoid areas where fluids may collect.
- Use split neutral electrodes with a sufficiently large surface area (patient age and max. output power during operation have to be considered).

Before applying the neutral electrode

- ▶ Shave the area where the neutral electrode will be applied.
- ▶ Clean the application site, but do not use any alcohol, since it dries out the skin and increases the contact resistance.
- ▶ If the patient has poor circulation, massage or brush the application site.

- ▶ Attach the neutral electrode over the entire contact surface evenly. Secure reusable neutral electrodes with rubber bands or elastic straps so that they do not loosen when the patient moves. Ensure that the patient's circulation is not impaired (risk of necrosis).
- ▶ Never use wet clothes or conductive pastes.
- ▶ Ensure that no liquids (e.g. cleaning fluids, disinfectants, blood or urine) penetrate between the patient and the neutral electrode.
- ▶ Do not place the neutral electrode under the patient's buttocks or back.
- ▶ Ensure that there are no ECG electrodes in the current path of the HF device.
- ▶ Check the neutral electrode before and after use for damage and to ensure that they are working properly.
Replace defective accessories immediately

Example application using a disposable electrode

- ▶ Remove the protective film and attach the self-adhesive disposable electrode to the patient. Ensure that the long edge of the disposable electrode faces the operation site and the electrode is fully in contact with the skin. This avoids excessive current concentration on the short edge.
- ▶ Using both hands, press the self-adhesive disposable electrode firmly against the patient's skin.
- ▶ Clamp the electrode tab to the neutral electrode cable.
- ▶ After the operation, remove the disposable electrode carefully to avoid skin damage.

With a one-piece neutral electrode

- ▶ Check the one-piece neutral electrode during surgery.
- ▶ Ensure that the one-piece electrode is not blocked at the device.

With a split neutral electrode

- ▶ Apply the split neutral electrode correctly and without any additional objects, as otherwise the HF device may detect a path between the two sections due to other objects.
- ▶ See that the current flows equally to both parts of the split neutral electrode.

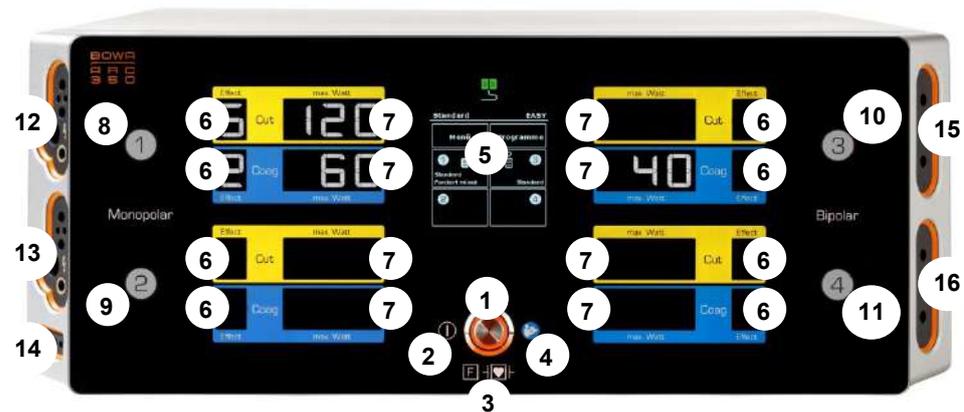


See Section Fault indications for EASY monitoring, page 69 regarding monitoring of the neutral electrode.

3. Description

3.1. User interface components

3.1.1. Front panel user interface components



- 1 On/-Off button
- 2 "CF-type device with defibrillation protection" icon
- 3 "Observe use instructions" icon
- 4 Touchscreen
- 6 Button Effect
- 7 Button maximum output power
- 8 Activation indication Monopolar 1
- 9 Activation indication Monopolar 2
- 10 Activation indication Bipolar 3
- 11 Activation indication Bipolar 4



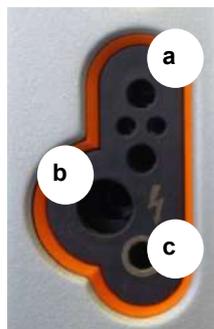
While activating an instrument, the Activation indication of the corresponding socket illuminates yellow or blue.

3.1.2. Monopolar connector module (left)

- 12 Monopolar 1
Socket connector for monopolar instruments with hand or foot switch*
- 13 Monopolar 2
Socket connector for monopolar instruments with hand or foot switch*
- 11 Socket connector for neutral electrode *

* Applied part type F according to IEC 60601-1

Monopolar connection sockets



- Alternative 1
- a** BOWA COMFORT 3-Pin US type
 - b** Bovie (footswitch)
 - c** 4 mm Socket (footswitch)

- Alternative 2
- a** BOWA COMFORT 3-Pin US type
 - b** Erbe 5 mm
 - c** 4 mm socket (footswitch)

Connection socket for neutral electrode



- 14** Neutral (US type)

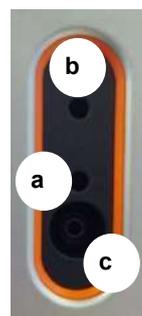
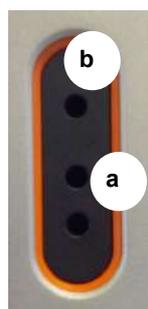
3.1.3. Bipolar connector module (right)

- 15** Bipolar 3
Socket connector for bipolar instruments with foot switch, finger switch or AUTOSTART*
- 16** Bipolar 4
Socket connector for bipolar instruments with foot switch, finger switch or AUTOSTART*

Bipolar connection sockets

Alternative 1:

Alternative 2:



- a** BOWA COMFORT
- b** 2-pin US type (28.58 mm)

- a** BOWA COMFORT
- b** 2-pin US type (28.58 mm)
- c** Erbe VIO/ICC

* Applied part type F according to IEC 60601-1

3.1.4. Rear panel user interface components



- 17 Foot switch socket connector 1
- 18 Foot switch socket connector 2
- 19 Equipotential bonding terminal
- 20 IEC power cord connector
- 21 Fiber-optic signal input connector
- 22 Fiber-optic signal output socket connector

Use the following connections only for service and training purposes:

- 23 Ethernet connector
- 24 USB connector
- 25 Audio In (not occupied)
- 26 UART communication interface
- 27 Power switch



The USB connector can be used to perform software updates.

The maximum voltage at the SIP/SOP ports is 15 V_{DC}.

3.2. Symbols used on the device

| Symbol | Designation |
|---|--|
|  | Foot switch connector |
|  | Neutral electrode isolated from ground for HF |
|  | CF-type device with defibrillation protection |
|  | Alternating current |
|  | On/off button |
|  | During activation (of the HF device) RF energy in the radio frequency range 9 kHz to 400 GHz is applied, which produces electromagnetic radiation. |
|  | Labeling of electrical and electronic devices in accordance with Directive 2002/96/EC (WEEE); see "Disposal" |
|  | (Active) HF output; caution: hazardous voltage |
|  | Manufacturer |
|  | Date of manufacture |
|  | Observe use instructions |
|  | Equipotentiality connection |
|  | Fiber-optic signal input |
|  | Fiber-optic signal output |
|  | Ethernet connector |
|  | USB connector |
|  | Audio In |
|  | UART communication interface |

3.2.1. Rating label

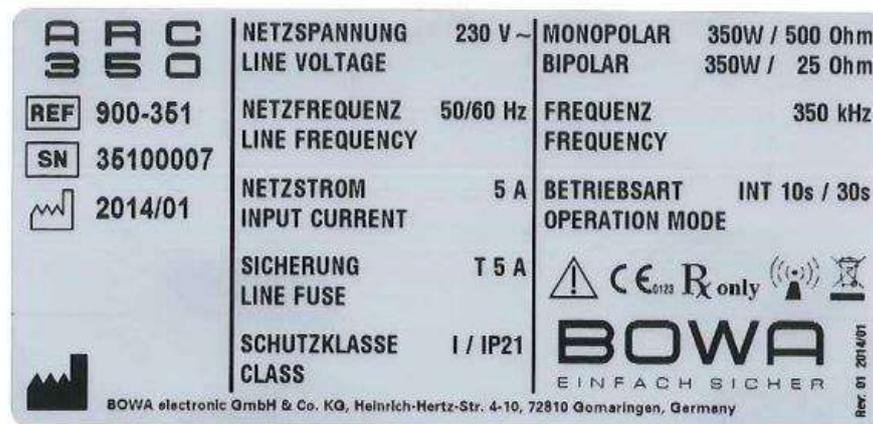


Figure 3-1: ARC 350 rating label

(Here: ARC 350 incl. options LIGATION and Bipolar Resektion, ARC 350 with option LIGATION bipolar output power changes to 200W, ARC 350 basic version provides a bipolar output power of 120W.)

3.3. Scope of delivery

You'll find detailed information on the scope of delivery in the current catalogues.

3.4. Components required for operation

- Power cable
- Foot switch
- Neutral electrode for monopolar applications
- Connection cable for neutral electrode or instrument
- Instrument (monopolar or bipolar)

3.5. Operating conditions

| | |
|----------------------------|---------------------------|
| Temperature: | +10 °C to +40 °C |
| Relative humidity: | 30 to 75%, non-condensing |
| Atmospheric pressure: | 700 to 1060 hPa |
| Operating altitude (max.): | 4000 m above sea level |

4. Prearrangement

4.1. Setting up the HF device



NOTE

Electromagnetic fields are generated during normal use of the HF device. This can adversely affect other devices.

- ▶ Ensure that no electronic devices are placed in the vicinity of the HF device.



WARNING

Shock hazard

- ▶ Always connect the HF device to a grounded power distribution system in order to prevent electric shock.



DANGER

Risk of burns to patients due to excessive leakage current

- ▶ Locate the HF device outside the immediate vicinity of the patient, see section Ambient conditions, page 11.



HF devices may be used only in rooms used for medical purposes that meet the requirements of DIN VDE 0100-710.



If the HF device was previously stored or transported at temperatures below +10 °C or a relative humidity above 75%, non-condensing, it will take approximately three hours to adjust to room temperature.

1. Observe the specified operating conditions (see Section Operating conditions, page 22).
2. Place the HF device on one of the following platforms:
 - a table;
 - an equipment trolley;
 - a console suspended from a ceiling support or wall-mounted brackets.
3. Place the HF device a sufficient distance away from other electronic equipment, see Section EMC, page 120.
4. Position the HF device with the front of the device facing the patient and surgeon.
5. Do not place any other device on the HF device.

6. Do not place any other objects on or above the HF device.
7. Place the HF device on top of ARC PLUS only, do not place it on other devices.
8. Connect the power cord.

4.2. Switching on the HF device



Do not use the HF device if the display components are not working. See Section faults Detecting and correcting faults, page 63 for troubleshooting instructions.

1. Switch the HF device on using the on/off switch.
 - ↳ The HF unit performs a self-testing: All user interface components light up.
2. Check all controls and indicators for proper operation:
 - Power switch
 - Touchscreen
 - Monopolar socket connectors
 - Bipolar socket connectors
 - Activation indication for monopolar and bipolar sockets
- ↳ The main screen appears, and the HF device is ready for use.
- ↳ The parameters of the most recently selected program appear on the display.

4.3. Connecting instruments

- ▶ Before connecting instruments, ensure that the following conditions are met:
 - Combinations of accessories not mentioned in the operating manual may be used only if they are explicitly designed for the intended use. Always observe performance characteristics and safety requirements.
 - The insulation of the accessories (e.g. HF cables and instruments) must be sufficient for the maximum peak output voltage (see IEC 60601-2-2 and IEC 60601-2-18).
 - Do not use accessories with defective insulation.

4.3.1. Instruments for monopolar use

1. Plug the neutral electrode cable into the socket for the neutral electrode and choose the corresponding neutral electrode type, see chapter Selecting the neutral electrode, page 35.
 - ↪ The socket illumination goes dark.
 - ↪ The neutral electrode button changes from grey to the measurement colour (green, yellow or red).
2. Connect the electrode handle to one of the two monopolar socket connectors.
 - or –
 - In the case of an accessory without a finger button, connect a footswitch to the socket connector. Connect the Bovie connector of the monopolar cable to the socket connector.
 - or –
 - Connect the monopolar cable for endoscopy to one of the two monopolar socket connectors for monopolar instruments.

4.3.2. Instruments for bipolar applications

1. Connect the bipolar cable to the instrument (e.g. forceps).
 2. Connect the bipolar cable to one of the two bipolar socket connectors.
 3. For bipolar use without AUTOSTART, connect a footswitch to the socket connector.
 - or –
 - Use the AUTOSTART mode for the appropriate socket connector.
- ↪ Once the instrument is connected, the application starts after the configured delay time.

4.3.3. Connecting a foot switch

In addition to the manual switch, a foot switch can be used to activate various operating modes.

- ▶ Connect the desired foot switch only during operation to one of the two socket connectors for foot switches.
- ↪ The HF device automatically detects the connected foot switch and indicates this on the front panel display, including the selected socket connector.



One double-pedal foot switch and one single pedal foot switch can be connected. Foot switches without an orange changeover switch cannot be used. Only foot switch and fibre optics may be connected to the rear panel during operation.

The following foot switch systems can be connected to the HF device:

| Item no. | Designation |
|----------|---|
| 901-011 | Single-pedal foot switch with switch |
| 901-031 | Double-pedal foot switch with switch |
| 901-032 | Double-pedal foot switch with switch and clip |

4.4. Functional test

4.4.1. Auto test function

The HF device automatically performs cyclic testing during operation. If any faults occur, see Section Detecting and correcting faults, page 63.

4.4.2. Functional testing

Perform the following functional test before putting the device into service:



The accessories must be designed for the specified maximum voltage.

1. Connect the neutral electrode and attach it securely to the patient's arm.
 - ↳ The EASY neutral electrode indicator changes to green.
2. Remove the neutral electrode.
 - ↳ The indicator changes to red, acoustic signals sound.



The neutral electrode used for this test may not later be used for an operation.

3. Connect a monopolar HF handle to a monopolar socket connector if there is a green EASY indicator and use the manual switch and footswitch to individually activate "Cut" and "Coag".
4. Check the settings on the display.
5. Now change to the bipolar output and connect bipolar forceps.
6. Select a mode with AUTOSTART, grasp moist gauze with the forceps, and check the display.
7. Now change to a mode without AUTOSTART and use the footswitch to activate the bipolar output. Check the settings and indicators in the bipolar section.

4.4.3. Actions in case of problems

Proceed as follows in case of functional problems:

1. Immediately disconnect the patient from the HF device.
2. Inspect the HF device and perform a functional test.
3. Report incidents and near-accidents to the German Federal Institute for Medications and Medical Products in accordance with Section 3 of the German Ordinance on the Installation, Operation and Use of Medical Products (MPBetreibV). Observe the provisions of the in-house reporting system in this regard.
4. Consult the Technical Service department, see Section Technical service, page 73.



The HF device can be switched off at any time by using on/off switch **27** as an emergency stop switch.

4.5. Neutral electrode monitoring



Always use the largest possible electrode when attaching a neutral electrode.

4.5.1. General information



BOWA recommends using split neutral electrodes, since only this type of electrode allows the HF device to detect detachment of the neutral electrode if this occurs.

Monitoring of the neutral electrode minimizes the risk of burns at the site where the neutral electrode is attached.

Two types of neutral electrodes can be monitored:

- Split electrodes for infants (for use with reduced power)
- Split neutral electrodes

The type of neutral electrode and its contact quality are selected and/or shown in Neutral Electrode Modes menu.

Faults related to the neutral electrode and possible remedies are shown on the display, see Section Detecting and correcting faults, page 63.

4.5.2. EASY neutral electrode monitoring (EASY monitoring)



The maximum output power of monopolar current types is reduced to 50 W when a children's electrode is selected.

The EASY monitoring function measures changes in the resistance between the patient and the high-frequency surgery device before and during HF activation. If necessary, it generates visual and audible alarms to request staff intervention. This requires using a split neutral electrode with appropriate contact areas and suitable contact resistance, attached to the patient according to the manufacturer's instructions. The EASY system does not monitor the currents through the individual contact surfaces of the split neutral electrode.

For the programs "Resection" and "Moderate Coagulation" a BOWA electrode with a surface area of at least 90 cm² must be used.

If an error message is generated, the display changes from green via yellow to red, depending on the type of fault.



NOTE

Risk of incorrect application of the neutral electrode

- ▶ Ensure compliance with the specifications for correct attachment of the neutral electrode with regard to size, adhesive properties and full-surface contact of the complete electrode.
-

5. Operation

5.1. Connecting power

☑ The line voltage must match the voltage specified on the rating label.
Connect the power cord to the generator and plug the cord into a grounded AC power outlet.

Use the power switch **27** on the rear side of the unit to switch on the device.



Use the on/off switch on the front panel to switch on the device.

- ↪ The device performs a functional test.
- ↪ The activation indicators illuminate.
- ↪ Full functionality of the loudspeaker is indicated by the start melody.

5.2. Program overview



Figure 5-1: Program overview

In the middle of the screen is the display to control the menu.

The activation indications and buttons to set the maximum output power and the effect are allocated next to the corresponding sockets.

The effect of electrosurgical cutting or coagulation can be set using the button "Effect".

The "max. Watt" button is used to set the maximum output power.

5.2.1. Display



Figure 5-2: Standard display

In the upper segment of the display the "EASY" button is allocated.

In the lower part of the display the program name, the neutral electrode type, as well as the buttons "Menu", "Programs" and settings of the current type and pedal for the four sockets are allocated.

In combination with ARC PLUS and the selection of Argon modes, instead of the button "Programs" the "Argon" menu is shown.



In this case the program can be selected using Menu "Select program".

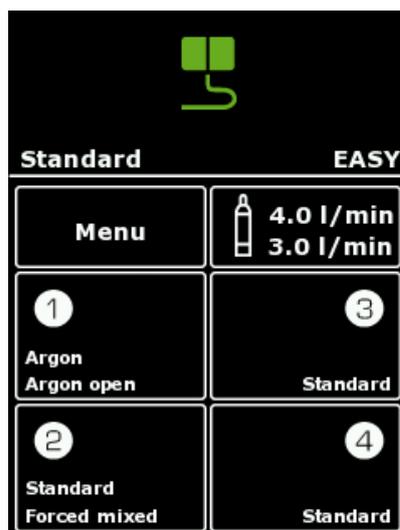


Figure 5-3: Argon display

5.3. Activating and deactivating connectors

- ▶ To activate a deactivated socket connector, plug a connecting cable into the connector.
– or –
Tap the activation indication of the associated socket.
- ↪ The selection field and the activation indication lights up.
- ▶ When detaching the instrument, the activation indicator extinguishes.
- ▶ To hide sockets tap the activation display of the associated socket.
- ↪ The parameters for maximum power and effect are grayed out.

5.4. Configuring output currents



All selection windows are closed after 30 seconds without assumption of the modification.



If selection screens are present, buttons outside the screen stay active and when being touched close the present screen without modification. In addition, activations not possible in this case.

5.4.1. Selecting the mode

1. To select the type of current, select the setting of the respective socket.
- ↪ A menu appears to select the program, the foot switch assignment as well as the modes for cutting or coagulation.

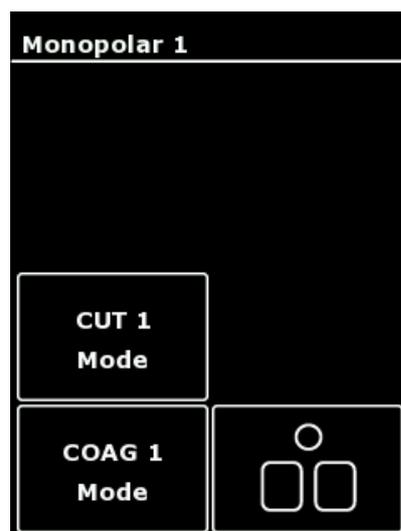


Figure 5-4: Menu Monopolar 1

2. Choose the menu of the required current type using the "Mode" button.
- ↪ A selection screen appears for the available modes.

↪ The active mode is indicated with an orange arrow.



Figure 5-5: Modes monopolar cutting

3. Select the required mode using the arrow keys.
 - or -
 - Deactivate the mode by selecting "Off".
 4. Confirm the selection with the "OK" button.
- ↪ The main screen is displayed.
- or -
- To return to the main screen without changing the selection, select "Back" or tap any button outside the selection menu.



If a mode is changed within a socket, the set parameters e.g. effect and max. Watt, remain the same for the respective mode. However, if, for example, the factory default setting of a mode is adapted and subsequently changed to a different mode and then back again, the user changes are not undone.

5.4.2. Specifying power limits

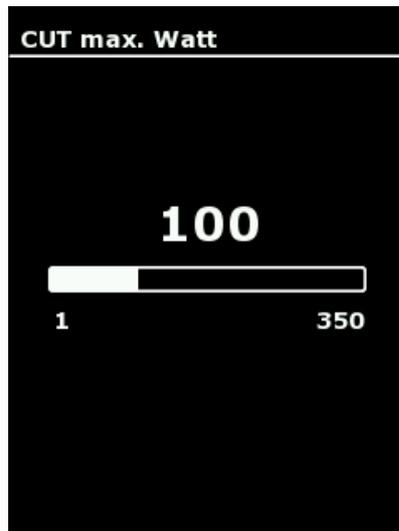


Figure 5-6: Power limit monopolar cutting

1. To select the maximum power for monopolar cutting, select the icon under the "max. Watt" button.
2. Use the "+" and "-" buttons to adjust the power level.
3. Confirm your selection by pressing the "OK" button.
- or -
To return to the main screen without changing the selection, tap any button outside the selection menu.

5.4.3. Selecting the effect

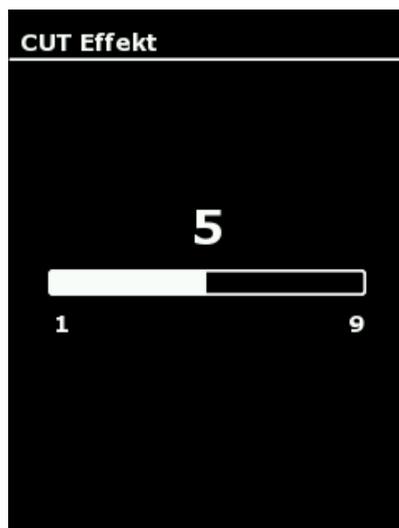


Figure 5-7: Effect monopolar cutting

1. To select the maximum power tap the parameters below the display "Effect".
2. Use the "+" and "-" buttons to adjust the effect.

3. Confirm your selection by pressing the "OK" button.
 - or -
 To return to the main screen without changing the selection, tap any button outside the selection menu.

5.4.4. Assigning the foot pedal



Handles and instruments with manual switches can be activated without a configuration setting.

A single-pedal foot switch and/or double-pedal foot switch, each with a changeover switch, can be connected,

The changeover switch enables switching between pedal levels.

1. Select the foot switch menu using the selection of the respective socket
 ↪ A menu appears for selecting the program, foot switch assignment as well as modes for cutting or coagulation.
2. Enter the selection menu of the footswitch using the "Pedal" button on.

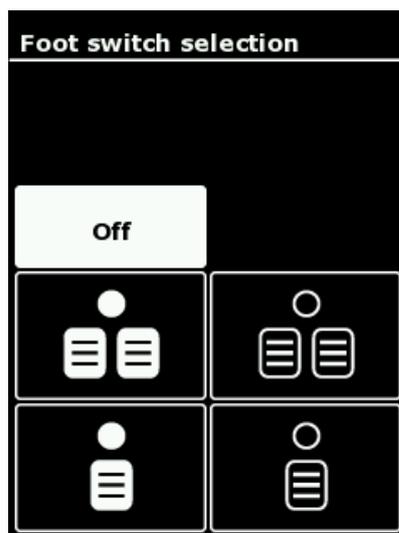


Figure 5-8: Foot switch selection

3. Select the required foot switch by pressing the corresponding button.
 For example, you could select the active pedal level for cutting, and coagulation for the top, left-hand socket.
 - or -
 Deactivate the footswitch using the "Off" button.
4. Confirm the selection by pressing the "OK" button.
 - or -
 To return to the main screen without changing the selection, tap any button outside the selection menu.

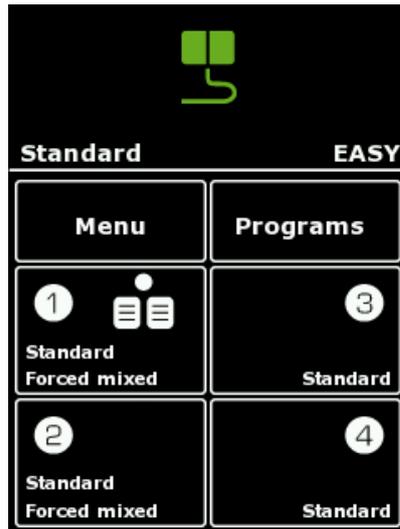


Figure 5-9: Foot switch changeover

- Pedal levels can be changed using the foot switches. Press the orange button to change the socket.



If two footswitches are connected, either a single-pedal footswitch or a double-pedal footswitch can be selected for coagulation.

5.4.5. Selecting the neutral electrode

- Press the "EASY" button in the upper segment of the display to select the neutral electrode.
- or -
Alternatively, use "Menu" "neutral electrode" to select the neutral electrode.
- ↪ The neutral electrode menu with a display of contact quality as well as selection of the neutral electrode types is shown.
 - ↪ The selected neutral electrode type is displayed in white.

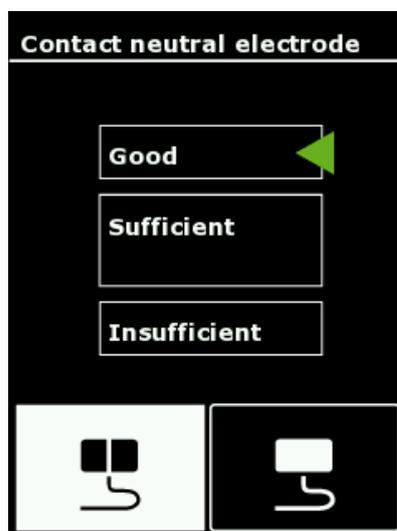


Figure 5-10: Neutral electrode menu

2. Select the type of connected electrode by selecting the icon for split or non-split neutral electrodes.
3. In the selection of split neutral electrodes there is also a reduced power mode for children electrodes available



The maximum power output of monopolar current types is reduced to 50 W when a children's electrode is selected.

4. Confirm your selection by pressing the "OK" button.
- or -
To return to the main screen without changing the selection, tap any button outside the selection menu.
- ↩ The selected type of neutral electrode in connection with a colour-indicator for the contact quality is shown in the status bar.



When using the "EASY" and "BABY" mode, no non-split electrodes are accepted. Using the "MONO" mode, no split electrodes are accepted.

According to the contact quality, several icons are shown for neutral electrodes:

| Icon / Button | Description | Icon / Button | Description |
|---------------|---|---------------|---|
| | Split neutral electrode contact quality OK | | Non-split neutral electrode contact quality OK |
| | Split neutral electrode contact quality not optimum | | Not Detected non-split neutral electrode or connected or contact quality insufficient |
| | Split neutral electrode not connected or contact quality insufficient | | Display the contact quality. |

5.4.6. Plug'n Cut COMFORT

The automatic instrument identification Plug'n Cut COMFORT recognises the connected BOWA COMFORT instrument and selects the default parameters automatically.

1. Insert the COMFORT instrument into a socket of ARC 350.

↪ The accepted parameters are displayed

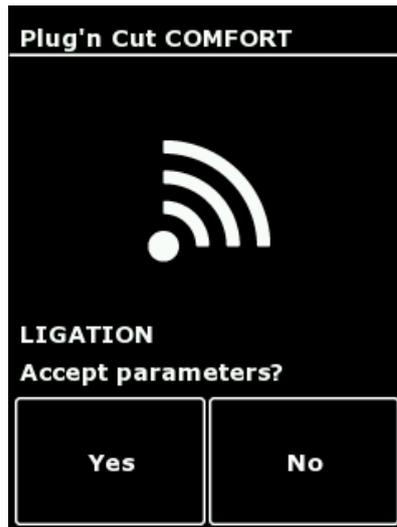


Figure 5-11: Plug'n Cut COMFORT

2. Confirm the selection of preferred parameters with "Yes".

- or -

Return to the main screen without accepting the preferred parameters with "No".



This function is available if the device has an option Argon / GastroCut, Bipolar Resection or LIGATION.

5.5. Mode overview

An overview of the programs that can be executed with the HF device is shown below.

5.5.1. Monopolar modes

| Monopolar Cutting | Monopolar Coagulation |
|----------------------------|---------------------------------|
| Standard | Moderate |
| Micro | Forced coag |
| Dry | Forced mixed |
| MetraLOOP | Forced cutting |
| Resection | Spray |
| Laparoscopy | Laparoscopy |
| Argon * | Argon open* |
| GastroLOOP 1 ^G | Argon flexible ^{*G} |
| GastroLOOP 2 ^G | Argon flex. pulse ^{*G} |
| GastroLOOP 3 ^G | Gastro Coag ^G |
| GastroKNIFE 1 ^G | Resection |
| GastroKNIFE 2 ^G | Mammary |
| GastroKNIFE 3 ^G | Thorax |
| | SimCoag |



* These modes can only be used in connection with the argon coagulation unit ARC PLUS (900-001).

^G These modes are available with the option Argon / GastroCut (900-391).

5.5.2. Bipolar modes

| Bipolar Cutting | Bipolar Coagulation |
|--------------------------------|--------------------------------|
| Bipolar Cutting | Standard |
| Bipolar Resection ^R | Standard AUTO |
| Bipolar Scissors | Micro |
| | Forced |
| | LIGATION ^L |
| | TissueSeal PLUS ^L |
| | Bipolar Scissors |
| | Laparoscopy |
| | Bipolar Resection ^R |



^R These modes are available with the option Bipolar Resection (900-395).

^L These modes are available with the option LIGATION (900-396).



The information and data regarding settings, application points, application duration and instrument use are based on clinical practice. However, these are only basic guidelines which must be tested for suitability by the operator. Depending on individual conditions, it may be necessary to deviate from the provided data. Medical practice is continuously evolving as a result of R&D and clinical experience. This may also make deviations from the provided data necessary.

5.6. Monopolar cutting modes

5.6.1. Standard

In this mode a high-performance HF current with a low crest factor is used for cutting biological tissue. ARC CONTROL quickly adjusts the power output to the minimum required level in response to variations in tissue type and changes in the cutting area or speed.

Application areas

Cutting tissue with low electrical resistance, such as muscle tissue or vascular tissue.

Cutting or preparing fine structures

Suitable instruments

- Needle electrodes
- Knife electrodes
- Spatula electrodes
- Sling electrodes

5.6.2. Micro

This mode is used for electrosurgical cutting using micro-electrodes. It enables extremely fine control of the power level and precise work.

Application areas

Paediatric surgery, neurosurgery, plastic surgery

Suitable instruments

- Micro needle electrodes

5.6.3. Dry

This mode is used for monopolar dry cutting. A large, controlled arc is generated, which allows significantly deeper coagulation to be obtained.

Application areas

Cardiac surgery and blood coagulation in retracting blood vessels in the sternum region.

Suitable instruments

- Knife electrodes

5.6.4. Argon

This mode is used to perform open surgical interventions in combination with the ARC PLUS companion device for argon-assisted cutting. With suitable instruments connected, argon-assisted cutting can be performed using rigid electrodes.

Application areas

Visceral surgery

Suitable instruments

- Rigid argon electrodes
- Argon handles

5.6.5. Resection

This mode is used in gynaecology and urology. ARC control generates the cutting effect with simultaneously minimized output power. ARC control facilitates direct cutting and prevents electrode adhesion.



Use non-conductive irrigation fluids.

Application areas

Hysteroscopy, transurethral prostate resection (TUR-P), surgical treatment of bladder tumors (TUR-B), vaporization of prostate tissue (TUR-VAP).

Suitable instruments

- Resectoscope (monopolar)
- Resection snare
- Rollerblade electrode

5.6.6. MetraLOOP

This mode is used in gynaecology for laparoscopic hysterectomy. Removal of the uterus can be achieved by applying monopolar cutting current and pulling on the snare at the same time.

Application areas

Gynaecology; laparoscopic hysterectomy

Suitable instruments

- Gynaecological laparoscopic snares

5.6.7. Laparoscopy

This mode is used in laparoscopy and arthroscopy for monopolar cutting.

Application areas

Laparoscopy, arthroscopy

Suitable instruments

- Arthroscopy electrodes
- Laparoscopy electrodes

5.6.8. GastroLOOP 1 (optional)

This mode is used in gastroenterology. Polypectomy snares are used for cutting and coagulation. ARC control generates the cutting effect with simultaneously minimized output power. This mode consists of a series of cutting current pulses followed by a coagulation phase. With a relatively slow pulse rate of 1 cutting pulse per second, this mode is suitable for especially cautious work.

Application areas

Polyp removal using polypectomy snares and flexible endoscopy

Suitable instruments

- Polypectomy snares



This function is available if the device has the options argon / GastroCut (900-391).

5.6.9. GastroLOOP 2 (optional)

This mode is used in gastroenterology. Polypectomy snares are used for cutting and coagulation. ARC control generates the cutting effect with simultaneously minimized output power. This mode consists of a series of cutting current pulses followed by a coagulation phase. With an accelerated pulse rate of 1.8 cutting pulses per second, this mode is suitable for experienced users.

Application areas

Polyp removal using polypectomy snares and flexible endoscopy, with accelerated pulse rate for experienced users.

Suitable instruments

- Polypectomy snares



This function is available if the device has the options argon / GastroCut (900-391).

5.6.10. GastroLOOP 3 (optional)

This mode is used in gastroenterology. Polypectomy snares are used for cutting and coagulation. ARC control generates the cutting effect with simultaneously minimized output power. This mode consists of a series of cutting current pulses followed by a coagulation phase. With an accelerated fast pulse rate of 3.2 - 5 cutting pulses per second, this mode is suitable for advanced users.

Application areas

Polyp removal using polypectomy snares and flexible endoscopy, with accelerated fast pulse rate for advanced users.

Suitable instruments

- Polypectomy snares



This function is available if the device has the options argon / GastroCut (900-391).

5.6.11. GastroKNIFE 1 (optional)

This mode is used in gastroenterology. Instruments for papillotomy and endoscopic resections are used for cutting and coagulation. ARC control generates the cutting effect with simultaneously minimized output power. This mode consists of a pulse sequence of cutting current and coagulation phase. With a relatively slow pulse rate of 1.3 cutting pulse per second, this mode is suitable for especially cautious work.

Application areas

Papilla incision using a papillotome and flexible endoscopy, resection with needle knives; slow pulse rate for cautious work.

Suitable instruments

- Papillotome
- Needle knives



This function is available if the device has the options argon / GastroCut (900-391).

5.6.12. GastroKNIFE 2 (optional)

This mode is used in gastroenterology. Instruments for papillotomy and endoscopic resections are used for cutting and coagulation. ARC control generates the cutting effect with simultaneously minimized output power. This mode consists of a pulse sequence of cutting current and coagulation phase. With an accelerated pulse rate of 1.7 cutting pulses per second, this mode is suitable for experienced users.

Application areas

Papilla incision using a papillotome and flexible endoscopy, resection with needle knives; accelerated pulse rate for experienced users.

Suitable instruments

- Papillotomes
- Needle knives



This function is available if the device has the options argon / GastroCut (900-391).

5.6.13. GastroKNIFE 3 (optional)

This mode is used in gastroenterology. Instruments for papillotomy and endoscopic resections are used for cutting and coagulation. ARC control generates the cutting effect with simultaneously minimized output power. This mode consists of a pulse sequence of cutting current and coagulation phase. With an accelerated fast pulse rate of 2.2 cutting pulses per second, this mode is suitable for advanced users.

Application areas

Papilla incision using a papillotome and flexible endoscopy, resection with needle knives; accelerated fast pulse rate for advanced users.

Suitable instruments

- Papillotome
- Needle knives



This function is available if the device has the options argon / GastroCut (900-391).

5.7. Monopolar coagulation modes

5.7.1. Moderate

This mode is used with contact coagulation to stop hemorrhagic oozing, for hemostasis of relatively large tissue areas, and for small-area coagulation. Tissue carbonization is prevented and electrode adhesion to the tissue is strongly reduced. Greater coagulation depth is achieved in this mode than in other coagulation modes. The degree of surface scabbing can be controlled by adjusting the "Effect" setting in the range of 1 to 3.

Application areas

Coagulation with relatively high penetration depth; low electrode adhesion to tissue

Suitable instruments

- Electrodes with large contact areas, such as ball electrodes

5.7.2. Forced coag

This mode is used for contact coagulation with low tissue penetration, preferably using fine electrodes and electrodes with small contact areas. It achieves a high degree of coagulation with low cutting tendency.

Application areas

Fast coagulation with small penetration depth

Suitable instruments

- Ball electrodes
- Knife electrodes
- Spatula electrodes

5.7.3. Forced mixed

This mode is used for contact coagulation with low tissue penetration, preferably using fine electrodes and electrodes with small contact areas. It achieves a high degree of coagulation with moderate cutting tendency.

Application areas

Fast coagulation with small penetration depth and moderate cutting tendency

Suitable instruments

- Knife electrodes
- Spatula electrodes
- Insulated monopolar forceps

5.7.4. Forced cutting

This mode is used for contact coagulation with low tissue penetration, preferably using fine electrodes and electrodes with small contact areas. It achieves good hemostasis with very good cutting tendency.

Application areas

Fast coagulation with small penetration depth and very good cutting tendency

Suitable instruments

- Knife electrodes
- Spatula electrodes
- Needle electrodes

5.7.5. Spray

This mode is used with non-contact surface coagulation using an arc, for hemostasis in parenchymal tissue, in poorly accessible crevices, and in conjunction with argon coagulation.

Application areas

Promoting coagulation of diffuse bleeding

Suitable instruments

- Ball electrodes
- Knife electrodes
- Spatula electrodes
- Needle electrodes

5.7.6. Argon open

This mode is used for open surgical interventions in conjunction with the ARC PLUS accessory device for argon-assisted electrocoagulation.

This is the current type Spray.

With suitable instruments connected, argon-assisted coagulation can be performed using rigid electrodes.

Application areas

Visceral surgery

Suitable instruments

- Rigid argon electrodes
- Argon handpiece

5.7.7. Argon flexible (optional)

This mode is used for argon-assisted electrosurgery in conjunction with the ARC PLUS accessory device.

This is the current type Spray.

For argon-assisted coagulation, flexible probes are used in combination with endoscopes.

Application areas

Gastroenterology, homogeneous surface coagulation

Suitable instruments

- Flexible argon probes



This function is available if the device has the options argon / GastroCut (900-391).

5.7.8. Argon flex. pulse (optional)

This mode is used for argon-assisted electrosurgery in conjunction with the ARC PLUS accessory device.

This is the current type Spray.

For argon-assisted coagulation, flexible probes are used in combination with endoscopes.

The puls frequency changes with the effect setting. The higher the effect level, the faster the pulse sequence.

Application areas

Gastroenterology, homogeneous surface coagulation

Suitable instruments

- Flexible argon probes



This function is available if the device has the options argon / GastroCut (900-391).

5.7.9. Resection

This mode is used for monopolar hemostasis in gynaecology and urology.



Use non-conductive irrigation fluids.

Application areas

Hysteroscopy, transurethral prostate resection (TUR-P), surgical treatment of bladder tumors (TUR-B), vaporization of prostate tissue (TUR-VAP).

Suitable instruments

- Resectoscope (monopolar)
- Resection snare
- Rollerblade electrode

5.7.10. Cardiac Mammary

This mode is used in mammary surgery and cardiac surgery. It produces forced coagulation.

Application areas

Mammary surgery and cardiac surgery

Suitable instruments

- Knife electrodes

5.7.10. Cardiac Thorax

This mode is used in thoracic surgery. It produces forced coagulation.

Application areas

Thoracic surgery

Suitable instruments

- Knife electrodes

5.7.11. SimCoag

This mode is used for simultaneous preparation. Two monopolar socket connectors can be activated at the same time to enable the simultaneous use of two manually switched instruments. Both handles can be switched on and off independently.

The current type changes with the effect setting:

Effect 1: Forced cutting

Effect 2: Forced mixed

Effect 3: Spray



The output power setting applies to both output sockets, and the power is distributed according to the tissue structure.

Application areas

Simultaneous coagulation and preparation, e.g. for cardiac or mammary surgery

Suitable instruments

- Ball electrodes
- Knife electrodes
- Spatula electrodes

5.7.12. Gastro Coag (optional)

This mode is used in gastroenterology with contact coagulation for the coagulation of small areas.

Application areas

After bleeding associated with polypectomy or papillotomy.

Suitable instruments

- Polypectomy snares
- Papillotome



This function is available if the device has the options argon / GastroCut (900-391).

5.7.13. Laparoscopy

This mode is used in laparoscopy and arthroscopy for monopolar coagulation.

Application areas

Laparoscopy, arthroscopy

Suitable instruments

- Arthroscopy electrodes
- Laparoscopy electrodes

5.8. Bipolar cutting modes

5.8.1. Standard

This mode is used for cutting with bipolar laparoscopic instruments.

Application areas

Laparoscopic cutting

Suitable instruments

- Laparoscopic instruments

5.8.2. Bipolar resection (optional)

This bipolar mode is used in gynaecology and urology for cutting under saline. ARC control technology generates the cutting effect with simultaneously minimized output power. ARC Control facilitates immediate cutting and prevents electrode adhesion.



Make sure that NaCl is used as an irrigation medium.
Secure a continuous irrigation during the application.
Always use conductive lubricants to avoid damages of the urethra.
Avoid continuous activations.

Application areas

Hysteroscopy, transurethral prostate resection (TUR-P), surgical treatment of bladder tumors (TUR-B), vaporization of prostate tissue (TUR-VAP).

Suitable instruments

- Resectoscope (bipolar)
- Resection snare
- Rollerblade electrode



This function is available if the device has the options Bipolar Resection (900-395).



Optimum results are provided exclusively when using BOWA COMFORT resection cables.

5.8.3. Bipolar scissors

This mode is used with bipolar scissors. It can be used for coagulation before or during cutting, point coagulation, coagulation of cuts and surface coagulation.

Application areas

Preparation, coagulation and cutting of tissue

Suitable instruments

- Bipolar scissors



Bipolar scissors should only be operated with the current type bipolar scissors cutting or bipolar scissors coagulation.

5.9. Bipolar coagulation modes

5.9.1. Standard forceps

This mode is used for arcless contact coagulation with forceps.

Application areas

Bipolar coagulation

Suitable instruments

- Bipolar forceps

5.9.2. Standard forceps AUTO

This mode is used for arcless contact coagulation with forceps. Activation starts automatically on contact with tissue.

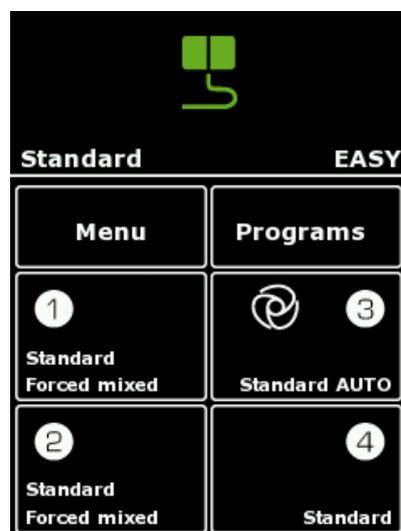


Figure 5-12: AUTOSTART at socket 3

The adjustable delay time can be set under MENU – SYSTEM SETTINGS – AUTOSTART DELAY.



Setting the AUTOSTART mode can result in unintentional coagulations, e.g. when bipolar forceps are used for gripping while the AUTOSTART Mode is on.

Application areas

Bipolar coagulation with AUTOSTART

Suitable instruments

- Bipolar forceps

5.9.3. Micro forceps

This mode is used for arcless contact coagulation with micro forceps. It enables extremely fine control of power output down to 0.1 W and precise work for tightly restricted bipolar contact coagulation.

Application areas

Bipolar coagulation in paediatric surgery, neurosurgery, plastic surgery, etc.

Suitable instruments

- Bipolar forceps
- Micro forceps

5.9.4. Forceps forced

This mode is used for forced coagulation with forceps.

Application areas

Fast bipolar coagulation

Suitable instruments

- Bipolar forceps

5.9.5. LIGATION (optional)

This mode is used for the permanent sealing of veins, arteries and tissue bundles. Conventional instruments cannot be used in this mode. The output power is preconfigured and automatically regulated.

Application areas

Vessel sealing open and laparoscopic

Suitable instruments

- TissueSeal[®]
- TissueSeal[®] PLUS
- NightKNIFE[®]
- LIGATOR[®]



This function is available if the device has the option LIGATION (900-396)

5.9.6. TissueSeal PLUS (optional)

This mode is used for the permanent sealing of veins, arteries and tissue bundles with TissueSeal PLUS[®] for open surgical applications. Conventional instruments cannot be used in this mode. The output power is preconfigured and automatically regulated.

Application areas

Vessel sealing in open surgery

Suitable instrument

- TissueSeal PLUS[®]



This function is available if the device has the option LIGATION (900-396)

5.9.7. Bipolar scissors

This mode is used with bipolar scissors. It can be used for coagulation before or during cutting, point coagulation, coagulation of cuts and surface coagulation.

Application areas

Preparation, coagulation and cutting of tissue

Suitable instruments

- Bipolar scissors



Bipolar scissors should only be operated with the current type bipolar scissors cutting or bipolar scissors coagulation.

5.9.8. Laparoscopy

This mode is used for coagulation in combination with bipolar laparoscopic instruments.

Application areas

Laparoscopic coagulation

Suitable instruments

- Laparoscopic instruments

5.9.9. Bipolar resection (optional)

This mode is used for bipolar haemostasis in gynaecology and in urology for cutting under saline.



Use NaCl as irrigation fluid.

Application areas

Hysteroscopy, transurethral prostate resection (TUR-P), surgical treatment of bladder tumours (TUR-B), vaporization of prostate tissue (TUR-VAP)

Suitable instruments

- Resectoscope
- Resection snare
- Rollerblade electrode



Make sure that the instrument has contact with the tissue while activating bipolar coagulation to avoid an unintended heating of the irrigation fluid.



This function is available if the device has the option Bipolar Resection (900-395)

5.10. Menu dialogs



The menu dialogs specify the settings of basic parameters, such as the user interface language and audio, display and memory options.

5.10.1. Overview

The following menu dialogs are available:

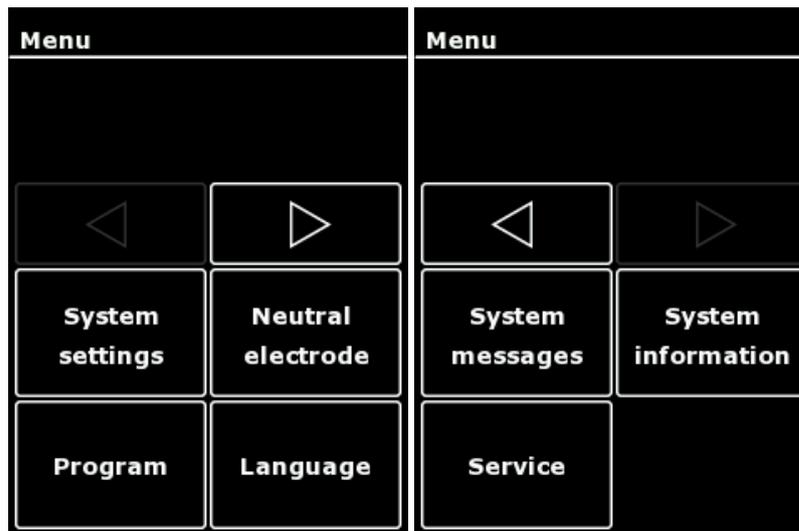


Figure 5-13: Menu dialogs

Selecting a dialog

- ▶ Switch to the required function with the horizontal arrow keys, and press the appropriate selection button to open the menu.

Exiting a dialog

- ▶ Press the "OK" button to return to the main screen.

5.10.2. "System Settings" dialog

The "System" menu allows settings for brightness and volume of the alarm activation and key tones, as well as autostart delay.

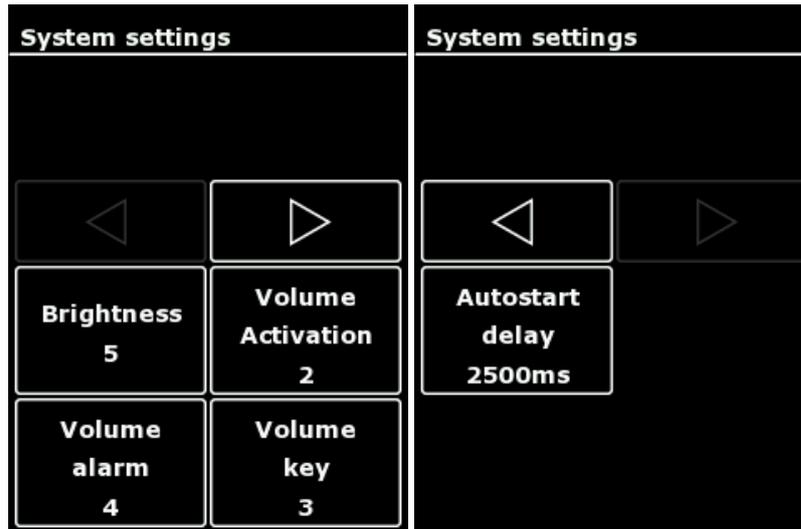


Figure 5-14: "System settings" dialog

1. To change the system settings, tap the desired parameter.
2. Change the setting in single steps with the keys "+" and "-"
3. Confirm the selection with the "OK" button.
- or -
To return to the main screen without changing the selection, tap any button outside the selection menu.



The volume of the activation signal should be increased as necessary for use in relatively noisy surroundings. The alarm tones have a minimum volume and limited changeability.

| Mode | Category | Frequency (Hz) | Signal type |
|-------------------------|------------------|----------------|-------------------|
| Monopolar Cut | Activation tones | 635 | Continuous sound |
| Monopolar Coag | Activation tones | 475 | Continuous sound |
| Bipolar Cut | Activation tones | 565 | Continuous sound |
| Bipolar Coag | Activation tones | 505 | Continuous sound |
| Sim Coag | Activation tones | 755 | Continuous sound |
| GastroCut /LIGATION end | Alarm tones | - | alternating sound |
| Error | Alarm tones | - | Signal tone |
| Warning | Alarm tones | - | Signal tone |
| Note | Alarm tones | - | Signal tone |

5.10.3. "Neutral electrode" dialog

In the "Neutral electrode" menu the connected neutral electrode type is selected and the contact quality is displayed, see chapter Selecting the neutral electrode, page 35.

5.10.4. “Program“ dialog

In the “program“ dialog it is possible to choose, delete, sort and save programs.



Figure 5-15: Menu "Program"

Select program

1. Tap "Select program" to enter the program list.

Fast settings of this menu are possible by tapping the socket menu on the main screen, see chapter Selecting the mode, page 31.

↪ A list of saved programs appears.

↪ The currently loaded program is visualized by the orange arrow.

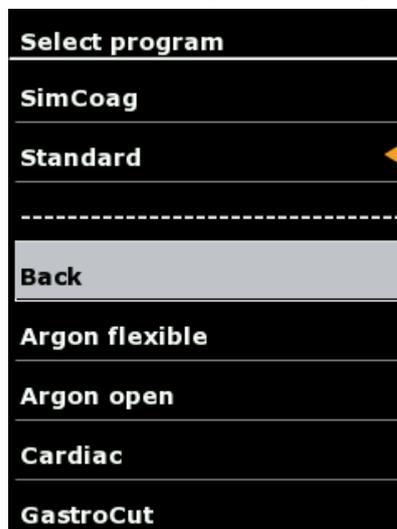


Figure 5-16: "Select program" dialog

2. Select the desired program by using the arrow keys.
3. Confirm the selection with the “OK“ button

↪ The main screen is displayed

- or -

To return to the main screen without changing the selection, select "Back" or tap any button outside the selection menu.

Delete Program

1. Tap "Delete program" to enter the program list
 - ↪ The system displays a red highlighted list of stored programs.
 - ↪ The currently loaded program is visualized by the orange arrow.
 4. Select the program to be deleted with the arrow keys.
 5. Confirm the selection with the "OK" button.
 - ↪ The main screen is displayed.
- or -
- To return to the main screen without changing the selection, select "Back" or tap any button outside the selection menu.

Sort program

1. Tap "Sort program" to sort the programs alphabetically, by favourites or by storage date.
2. Select the required order by tapping on the desired parameter.
- ↪ The "Program" dialog is displayed.

Save program

1. Tap "Save program" to save the current setting under the same or another program name.
 2. Choose "Save" to maintain the same program name for the current setting.
- or -
- Select "Save As" to place a new program name for the current setting.

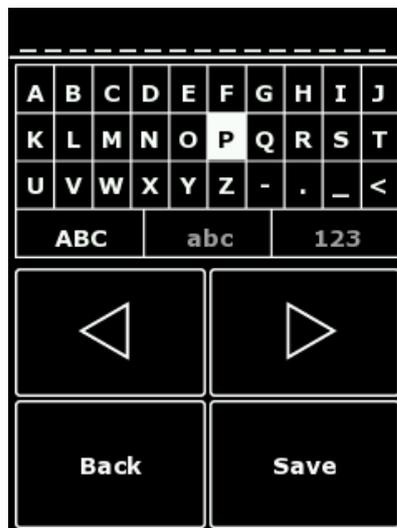


Figure 5-17: "Save program" dialog

In this menu, program names can be created. Several symbols, capital or small letters or numbers are selection options.

The navigation is possible using the arrow keys.

Select the letter with "OK".

The selection is confirmed using "Save".

Use the "Back" button to return to the main screen



The following basic programs are provided with the full version of ARC 350 (incl. the options GastroCut, Bipolar Resection and LIGATION): Argon flex, Argon, Cardiac, GastroCut, Laparoscopy, Macro, Micro, Open Surgery, Resection bipolar, Resection monopolar, SimCoag, Standard

5.10.5. "Language" dialog

The following languages are selectable in „language selection“:

German, English, French, Italian, Spanish, Russian, Polish, Turkish, Czech, Portuguese

5.10.6. "System messages" dialog

In the "System messages" dialog, it is possible to open the saved system messages which have occurred since switching on the HF device.

These messages are not saved when switching off the HF device.

Opening saved system messages:

1. Select a system message.
2. Tap "OK" to open the system message again.
3. Press again "OK" to return to the overview.
4. To return to the main screen without changing the selection, tap any button outside the selection menu.

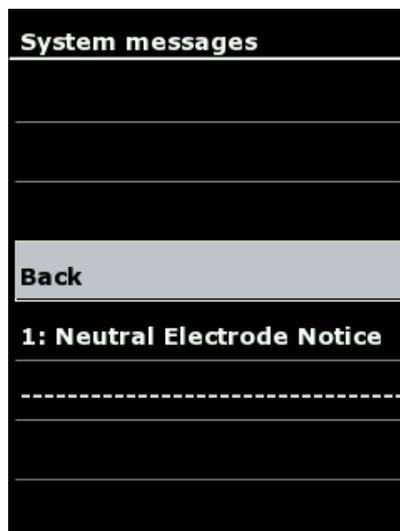


Figure 5-18: "System messages" dialog

5.10.7. "System information" dialog

The "System information" dialog displays various system parameters such as version, serial number, TSI dates for ARC 350 and ARC PLUS, as well as options.



Figure 5-19: "System information" dialog

See also technical safety inspection (TSI), page 71.

5.10.8. "Service" dialog

In the "Service" dialog contact detail are displayed, after entering a password, you can use the dialog to access additional options.

With the password **001224** you enter the service level.



Figure 5-20: "Service tools" dialog

Saving device settings

With the function "Backup device" device settings can be saved on the BOWA USB Stick (REF 900-402). This includes all stored programs and system settings.

Transferring device settings

Use "Restore device" to transfer saved device settings from a BOWA USB Stick (REF 900-402) to the ARC 350 unit.

EASY resistance monitor

With "EASY monitor" the resistance at the neutral electrode is displayed.

Configuring the startup screen

In ARC 350 is a possibility to create a personalized startup screen. This appears after switching on the device for a selectable duration.

1. Create a folder with the name "arc_logo" on the USB flash drive (REF 900-402).
 2. Open the Windows program " Notepad.exe " and enter a number between 5 and 60 for the displayed duration in seconds.
 3. Save this file on the USB flash drive in the folder "arc_logo" under the name "KH_Logo.conf". Make sure that the file is stored as type "All Files (*. *)" and encoding "UTF -8".
 4. Create a startup screen with a resolution of 240 x 320 pixels and save it under the name "KH_Logo_arc350.png" in the folder "arc_logo".
 5. Plug the USB flash drive with the files created in the USB port of the ARC 400 and turn the unit on using the main switch.
 6. Wait until the ARC 350 is fully booted and the user interface appears.
 7. Turn on the ARC 350 and remove your USB flash drive.
- ➡ Now your generated startup screen is permanently stored in the device and appears after every switching-on for the specified duration.

In the service menu, the stored startup screen can be deleted using "Remove logo".

Resetting to factory settings

The "Reset to default" function allows you to reset all settings and programs to factory settings.

5.10.9. "Argon" dialog

In case of the selection of an argon mode and a successful connection to ARC PLUS, the main screen displays an argon dialog with currently stored flow rates for cutting and coagulation.

The "Argon" dialog enables the selection of argon flow rates for cutting and coagulation, as well as the selection of argon bottles and the display of filling levels.

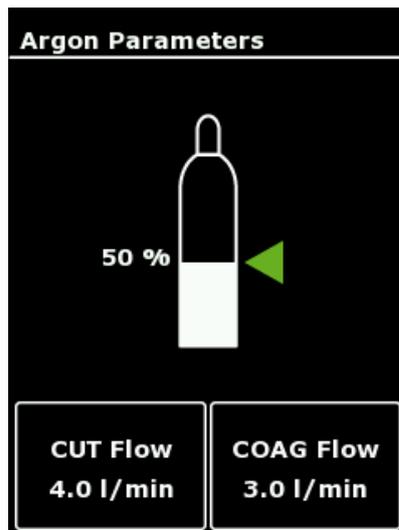


Figure 5-21: "Argon" dialog

1. Select the "Argon" menu by tapping the display of the flow rates.
 - ↳ The current filling level of the argon gas bottle is displayed when using a pressure reducer with electronic pressure sensor.
2. Select the variable flow rate for cutting (CUT flow) or coagulation (COAG flow).
3. Set the argon flow rate by using the arrow keys.
4. Confirm your selection by pressing the "OK" button.
 - or -
 - Press the "Back" button to return to the main screen without changing the selection.



Default settings for argon flow rates according to the different modes are selected automatically:

Argon open:
CUT flow rate: 4.0 l/min
COAG flow rate: 3.0 l/min

Argon flexible:
COAG flow rate: 0.4 l/min

6. Detecting and correcting faults

Two types of faults can occur:

- system faults
- EASY monitoring faults

6.1. System informations

A warning message appears on the display when a system fault occurs.

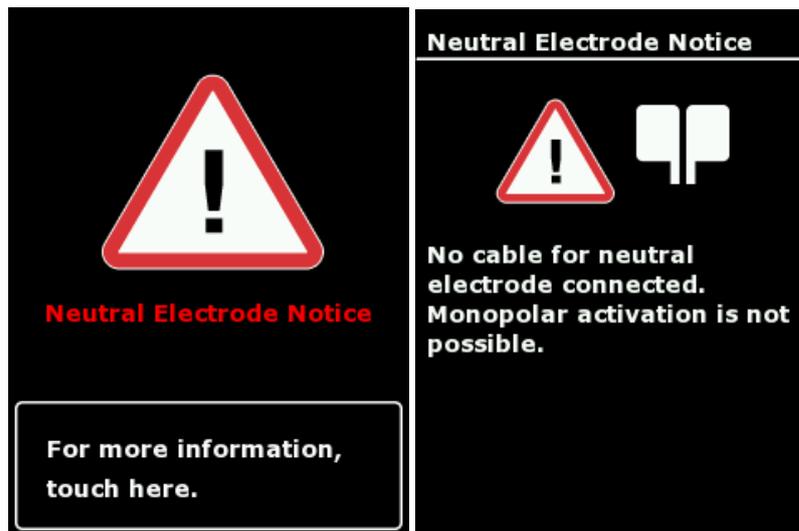


Figure 6-1: Confirmation neutral electrode

Further information to the cause and corrective measures for this message are available pressing the lower area of the screen.

System informations have three different categories:

- Notice (grey screen)
- Warning (orange screen)
- Error (red screen)

While an error is present, activations are prohibited.

The message is available using the orange marked „?“ in the system bar.

Moreover, these messages are available in the menu program system settings and will be deleted when switching off the unit.

The following table describes the cause of the fault and the appropriate corrective action.

| Heading | Fault message |
|--------------------------------|---|
| Confirmation of AUTOSTART Mode | You have selected an AUTOSTART mode. Setting the AUTOSTART mode can result in unintentional coagulations, e.g. when bipolar forceps are used for gripping while the AUTOSTART Mode is on. |
| AUTOSTART Error | The instrument is in contact with tissue. AUTOSTART cannot be selected when the instrument is in contact with tissue. Open up the instrument. |
| TSI Warning | The annual Technical Safety Inspection (TSI) is due. |
| Neutral Electrode Error | No neutral electrode connected. No neutral electrode connected. Connect a neutral electrode. |
| Neutral Electrode Error | Wrong neutral electrode connected.. The selection does not match the neutral electrode connected. Connect the neutral electrode which matches the selected mode, or change the mode to match the neutral electrode. |
| Neutral Electrode Error | Poor contact with the patient. The resistance between the neutral electrode and the patient is too high. Establish better contact of the neutral electrode. |
| Neutral Electrode Warning | Poor contact with the patient. The contact resistance between the neutral electrode and the patient is increasing. Establish better contact of the neutral electrode. |
| Neutral Electrode Error | No cable for neutral electrode connected. No cable for neutral electrode connected. Connect a cable for neutral electrodes. |
| Neutral Electrode Notice | No cable for neutral electrode connected. The cable for neutral electrode has been removed. Monopolar activation is not possible. |
| Mode Error | No mode selected. No mode was selected for this type of activation. Select the desired mode or change the foot switch assignment. |
| Mode Error | This mode is not allowed for baby neutral electrodes. Use split neutral electrodes with a large conductive surface for this mode. |
| Mode Error | This mode is not allowed for this socket. The current mode remains active. Choose another socket for this mode. |
| Foot Switch Error | Foot switch not assigned to a socket. The foot switch has not been assigned to a socket yet. Assign a socket to the foot switch using the "Pedal" button. |

| Heading | Fault message |
|-------------------------------------|--|
| Foot Switch Notice | The assignation of the foot switch has been changed. The orange button on the foot switch enables switching from socket A to B and back. The active foot switch assignation is displayed in the form of an orange dot. |
| Foot Switch Warning | Second foot switch assignment has not been set. There is no second foot switch assignment in place. The current assignment remains active. To allocate the second foot switch assignment press the "Pedal" push button on the desired socket. |
| Foot Switch Error | Fault on foot switch connection. Check the foot switch. If this message appears again, please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |
| Finger Switch Error | Fault on finger switch connection. Check the handle and the connection cable. Please replace them if damaged. If this message appears again please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |
| Finger Switch Error | Fault on finger switch connection. Check the handle and the connection cable. Please replace them if damaged. Instruments with one pin have to be connected to the marked socket. If this message appears again please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |
| Finger Switch Error | Fault on finger switch connection. Check the handle and the connection cable. Please replace them if damaged. If this message appears again please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |
| Temperature Warning | The temperature of the device is higher than normal. The temperature of the device is elevated. This leads to a reduction of the maximum power. |
| Limitation of Continuous Activation | The maximum activation time has been exceeded. Please only activate the generator in short intervals, in order to avoid harming the patient and damaging the connected instruments or the generator. |
| Mains Voltage Error | The mains voltage is too low. Please ensure a constant mains voltage. If necessary, connect a UPS (Uninterrupted Power Supply). |
| Activation Error | While switching on the device, there is an activation by foot switch, finger switch or AUTOSTART. Check the handles or foot switches for malfunctions. Disconnect the handles / foot switches from the device. If the error persists, please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |

| Heading | Fault message |
|---------------------------|--|
| Activation Error | There is an activation while connecting the foot switch or finger switch. Check the handles or foot switches for malfunctions. Disconnect the handles / foot switch from the device. If the error persists, please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |
| Activation Error | There is no instrument connected on the activated socket. Connect an instrument on the designated socket. |
| Activation Warning | The mode for safety inspections is active. Activation is not possible. Quit this mode before activating again. |
| Bipolar Resection Warning | No activation of the bipolar resection. Check the irrigation medium, the connection cable, the instrument and the selected settings. Make sure that NaCl is used as an irrigation medium. |
| GastroCut Notice | The polypectomy has been completed. |
| GastroCut Warning | Polypectomy snare not in contact with tissue, or check connection cable at snare or generator. Please apply the snare and reactivate. First of all establish contact between tissue and polypectomy snare, or check the connection cable at the snare or the generator. Then activate with the yellow foot pedal. |
| LIGATION Notice | The LIGATION has been completed. |
| LIGATION Warning | There is a short-circuit in the area of the sealing instrument. Please check the instrument for foreign material or contact with other objects. The sealing point must be free of foreign objects. |
| LIGATION Warning | The sealing instrument is not in contact with tissue. Please grasp tissue and reactivate LIGATION. Check the connection between instrument and generator. To perform LIGATION of vessel and tissue bundles it is necessary to grasp tissue and close the sealing instrument before activating. |
| ARC PLUS Fault | Please check if the argon bottles are connected and open. Empty bottles should be replaced. Subsequently restart ARC PLUS by activating the flashing "Purge" button. |
| ARC PLUS Fault | The argon inlet pressure is too high. Max. inlet pressure: <4.5bar Close a source of argon gas in the appropriate pressure range. Subsequently restart ARC PLUS by activating the flashing "Purge" button. |
| ARC PLUS Fault | The argon inlet pressure has exceeded the permissible limits. Inlet pressure range: 2 - 4.5bar Close a source of argon gas in the appropriate pressure range. Subsequently restart ARC PLUS by activating the flashing "Purge" button. |
| ARC PLUS Warning | Please check if the argon bottles are connected and open. Empty bottles should be replaced. Subsequently restart ARC PLUS by activating the flashing "Purge" button. |

| Heading | Fault message |
|----------------------------|--|
| ARC PLUS Warning | Mixed operation of argon bottles with and without an electric bottle pressure gauge is not recommended Connect two identical pressure reducers. |
| ARC PLUS Warning | Please check if the instrument is free of adhesions, and purge it with argon. If repeated purging does not solve the problem, the instrument and cable must be replaced. |
| ARC PLUS Warning | The argon flow settings at ARC 350 are invalid |
| ARC PLUS Warning | The filling level of the argon bottle is low. Please make sure that a replacement is available. You can connect two argon bottles. The unit shifts automatically to the second bottle. |
| ARC PLUS Fault | The argon bottle is empty. Connect a replacement bottle to enable activation. You can connect two argon bottles. The unit shifts automatically to the second bottle |
| ARC PLUS Notice | The argon bottle is empty. The unit has shifted automatically to the replacement bottle. Please make sure that a replacement is available |
| TSI ARC PLUS Warning | The annual Technical Safety Inspection (TSI) for ARC PLUS is due. |
| Plug'n Cut COMFORT Notice | The lifetime of the instrument is ending soon. Please order a replacement in good time. Any use of the instrument beyond its lifetime is not covered by warranty. Please contact your BOWA dealer in good time to purchase a new instrument. |
| Plug'n Cut COMFORT Warning | The maximum lifetime of the instrument has been reached. Any further use is not covered by warranty. The maximum service lifetime of the instruments must not be exceeded, in order to guarantee safe usage. Any further use is at the user's risk. |
| Plug'n Cut COMFORT Notice | You have connected a BOWA RFID instrument. X applications remain available. The maximum lifetime of the instruments must not be exceeded, in order to guarantee safe usage. Any further use is at the user's risk. |
| Dr. Dongle Notice | You can save up to six of your preferred programs on your Dr. Dongle and run them in a flexible way. With the "Load" button you can call a selected program. You can use the "Save" button to enter an explanatory text for the selected program. |
| Plug'n Cut COMFORT Warning | A software update is necessary to use Plug'n Cut COMFORT with this instrument. Only carry out manual settings at this instrument. Please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |
| Internal Error 4177 | If this message appears again, please contact the Technical Support. Internet: www.bowa.de Telephone: +49707260020 |

Internal Errors have a number next to the description.
Please advise the Technical Service of this number.

6.2. Fault indications for EASY monitoring

Fault indications are displayed in three stages (green, yellow and red) when problems occur.

When working with a split neutral electrode, the following faults may occur:

| EASY monitoring | Cause | Indication | Corrective measures |
|---------------------------------------|---|--|--|
| Flashes yellow | Significant increase in resistance Depending on the indication, there may be heating under the neutral electrode | – | Stopping the application is not necessary. Check the proper application of the neutral electrode. |
| Switches from green to continuous red | A significant problem occurred when the monopolar current was activated | An acoustic signal sounds. A warning message appears on the display | <ul style="list-style-type: none"> ▶ Check the neutral electrode and neutral electrode cable (see Section EASY neutral electrode monitoring (EASY monitoring), page 28. ▶ Check the neutral electrode cable for proper connection and external damage. |
| | Loosened electrode | An acoustic signal sounds. A warning message appears on the display | ▶ Reattach the neutral electrode. If the fault persists, replace the neutral electrode. |

7. Preparation

7.1. Preparation of the accessories

- ▶ Prepare the accessories (e.g. surgical handles, instruments, active electrodes, neutral electrodes and cables) as described in the corresponding operating manuals.
- ▶ Check the accessories before and after use for damage and to ensure that they are working properly.

7.2. Disinfection and cleaning



NOTE

Incorrect handling of the HF device can cause damage to the unit!

- ▶ Never sterilize the ARC 350 device. Instead, clean or disinfect it.
-



WARNING

Risk of electric shock and fire!

- ▶ Unplug the power connection before cleaning the device.
 - ▶ For cleaning surfaces, use the approved cleaning agents/disinfectants only as specified by the manufacturer.
 - ▶ Ensure that no liquid penetrates the device.
 - ▶ Ensure that the AUTOSTART function is deactivated.
-

1. Apply the cleaning agent and disinfectant.
2. Wipe the agent off with a sponge moistened with clean water or with a cloth.
3. Dry the device using a clean, lint-free cloth.

8. Maintenance and repair

8.1. Maintenance



DANGER

Infection hazard!

- ▶ Carry out a surface disinfection and wrap the device in addition to the shipping packaging material before allowing the device to leave the hospital or office to avoid spreading germs and infections.

- ▶ Check the device, the device trolley and the accessories (e.g. foot switch, cable) after each use for damage or defects. In particular, make sure that the insulation is intact on all cables.
- ▶ Do not use any damaged device, damaged device trolley or damaged accessories.
- ▶ Replace defective accessories immediately.
- ▶ Have the safety inspection for the device performed once a year. Please consult and comply with the respective service instructions for additional technical information.

8.1.1. Safety inspection

Safety inspections must be performed once a year.

- ▶ The next safety inspection date of ARC 400 can be displayed in the dialog, see "BOWA Service" dialog, page 61
- ↪ A warning message appears during system start-up if a safety inspection is due. Further work is still possible, confirm this with "OK".



Any shorter safety inspection cycles specified in national regulations must be observed.

- ▶ The device and accessories may be inspected only by persons who have the required training, knowledge or experience and who can perform the inspection independently.
- ▶ With regard to the safety inspection, you must comply with the country-specific rules and regulations.

The inspector documents the inspection results and measured values corresponding to the printed inspection protocol.

In the case of severe deviations from the values of the attached final acceptance report, or if the specified maximum values were exceeded:

- ▶ Send the HF device to the service centre, see section Technical service, page 73.

8.2. Repairs



NOTE

You can damage the HF device by doing your own repairs and modifications of medical equipment!

- ▶ If a repair is necessary, contact the service address mentioned in chapter 9.1.
 - ▶ Never carry out any repairs yourself.
-

BOWA is liable for safety, reliability and performance of the HF device under the following conditions:

- Full compliance with all instructions regarding the installation and proper use for the intended purpose contained in this operating manual was maintained.
 - Changes, repairs, new settings and similar procedures were carried out only by persons authorized to do this work by BOWA.
 - The electrical installations in the relevant room meet the local requirements and statutory provisions.
-



Fast and satisfactory repairs can only be guaranteed when all required data have been supplied in full.

The following information is required for returning the device:

- complete address
 - model number
 - serial number
 - software version
 - ▶ Describe the problem, the appropriate application and the accessories used.
- or –
- ▶ Describe the repairs to be made.
-

9. Storage

- ▶ If you store the HF device for longer than one year, pay specific attention to the indicators during automatic functional testing, see section Functional test, page 26.
- ▶ Clean the HF device thoroughly before you put it into storage.
- ▶ Store the HF device in a clean, dry place in accordance with the storage conditions.

Storage conditions:

- Temperature: -20 °C to +50 °C
- Relative humidity 0 to 75 %, non-condensing
- Atmospheric pressure: 500 to 1060 hPa

9.1. Technical service

Contact the following service center for maintenance and repair work:

BOWA-electronic GmbH & Co. KG

Heinrich-Hertz-Strasse 4–10

72810 Gomaringen, Germany

Phone +49 (0) 7072-6002-0

Fax +49 (0) 7072-6002-33

Email service@bowa.de

or visit our website:

www.bowa.de

10. Technical specifications

10.1. ARC 350 technical data

| Insulation type / Classification | |
|--|---|
| EMC | IEC 60601-1-2 |
| Level of protection provided by the housing | IP 21 |
| Protection class according to EN 60601-1 | I |
| Application component type according to EN 60601-1 | CF |
| Standards compliance | IEC 60601-1: 2005, IEC 60601-1-2: 2007, IEC 60601-2-2: 2009, ISO 14971: 2007, ISO 13485: 2003 + Cor.1_2009 |
| Classification according to EC Directive 93/42/EEC | IIb |

| Power connection | 220 V - 240 V | 100 V - 115 V |
|--|-------------------|--------------------|
| Power consumption in standby mode | 3 W / 40 VA | 3 W / 40 VA |
| Current consumption in standby mode | 200 mA | 400 mA |
| Maximum power consumption (at 350 W) | 700 W / 1150 VA | 700 W / 1150 VA |
| Maximum current consumption (at 350 W) | 5 A | 10 A |
| Line fuses | 2 x 5 A slow-blow | 2 x 10 A slow-blow |
| Input voltage range | 198 V to 264 V | 90 V to 130 V |
| Line frequency | 50 / 60 Hz | 50 / 60 Hz |
| Terminal for potential equalization | √ | √ |

| Dimensions and weight | |
|--|-----------------|
| External dimensions: width x height x depth (mm) | 430 x 180 x 475 |
| Weight | approx. 12.5 kg |

| Programs | |
|--|-----|
| Number of programs in the device | 350 |
| Default programs, factory set | √ |
| Individually programmable | √ |
| Program number and data shown on the display | √ |

| Neutral electrode monitoring | |
|---|--|
| EASY (Electrode Application System) | √ |
| Display indication of one-piece or split or Baby electrode in the main and neutral electrode menu | √ |
| Contact resistance between individual sections of split neutral electrodes shown on display with column for control | √ |
| Lead resistance shown on the display when a one-piece neutral electrode is used | √ |
| Maximum allowable resistance between the sections of a split electrode | 300 Ω |
| Warning signal for hazardous conditions beneath the neutral electrode | Visual, acoustic |
| Warning messages on display: | Text messages with further information |

| Safety features | |
|---|--|
| ISSys (Integrated Safety System) | √ |
| Continuous monitoring of HF leakage current with fault indication | Text messages with further information |
| Dosage monitoring with fault indication on the display | √ |
| Continuous self-test | √ |
| Continuous status indication on the display | √ |
| Operating errors shown on the display | Text messages with further information |
| System faults shown on the display | Text messages with further information |

| Documentation | |
|--|--|
| Data acquisition and storage in the device | System information with date |
| Fault states | √ |
| Operating errors | √ |
| Data retrieval via the display | Text messages with further information |

| Communication | |
|--|---|
| External interface for communication with ARC PLUS (light wire cables) | √ |
| USB interface for software updates | √ |
| External PC interface, UART, using BOWA software | √ |
| Service support using BOWA software | √ |

| Service support | |
|--|---|
| Network port for service support | √ |
| Service support by service programs integrated in the device | √ |
| Service support via ISSys | √ |

| Cooling | |
|----------------------------|---|
| Convection | √ |
| Temperature-controlled fan | √ |

| Duty factor | |
|--------------------|----------------------|
| Intermittent | 10 s / 30 s (on/off) |

| Characteristics | |
|--|--------------------------|
| Max. CUT Power (at 500 Ω) | 350 W |
| Max. COAG Power (at 25 Ω) | 350 W |
| Monopolar sockets | 2 x international / Erbe |
| Bipolar sockets | 2 x international / Erbe |
| Connection for footswitch | 2 x |
| AUTOSTART | √ |
| Bipolar finger switch | √ |
| Plug'n Cut COMFORT instrument identification | √ |

| Optionen | |
|-------------------|-------------|
| Argon / GastroCut | REF 900-391 |
| Bipolar Resection | REF 900-395 |
| LIGATION | REF 900-396 |

| Umweltbedingungen | Betrieb | Transport und Lagerung |
|--------------------------|---------------------------|-------------------------------|
| Temperature | +10°C to +40°C | -20°C to +50°C |
| Relative humidity | 30 to 75%, non-condensing | 0 to 90%, non-condensing |
| Atmospheric pressure | 700 to 1060 hPa | 500 to 1060 hPa |
| Operating altitude (max) | 4000 m a. sea level | |

| Description | CCS | ARC CONTROL | Form of HF voltage | Max. power output | | Peak voltage | Default values | |
|--------------------------------|-----|-------------|---|---|-------------------------|---|----------------|-----------|
| | | | | Effect | Power range | | Effect | Max. Watt |
| Modes Monopolar Cutting | | | | | | | | |
| Standard | Yes | Yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 350 W | 400 Vp 450 Vp 560 Vp 650 Vp 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 5 | 100 |
| Micro | Yes | yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 50 W | 280 Vp 340 Vp 380 Vp 400 Vp 400 Vp 400 Vp 450 Vp 450 Vp 450 Vp | 5 | 20 |
| Dry | Yes | yes | sinusoidal modulated | 1 2 3 4 5 6 7 8 9 | 1 W - 200 W | 1.4 kVp 1.4 kVp 1.4 kVp 1.4 kVp 1.5 kVp 1.6 kVp 1.6 kVp 1.6 kVp 1.6 kVp | 5 | 100 |
| Argon | Yes | yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 300 W | 400 Vp 450 Vp 560 Vp 650 Vp 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 5 | 100 |
| Resection | Yes | yes | sinusoidal constant | 1 2 3 4 5 | 250 W | 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 2 | --- |
| MetraLOOP | Yes | Yes | sinusoidal constant | 1 2 3 | 100 W 150 W 200 W | 650 Vp | 1 | --- |
| Laparoscopy | Yes | Yes | sinusoidal constant | 1 2 3 4 5 6 7 8 9 | 1 W - 200W | 400 Vp 450 Vp 560 Vp 650 Vp 650 Vp 700 Vp 700 Vp 700 Vp 750 Vp | 5 | 100 |
| GastroLOOP 1 | Yes | Yes | sinusoidal alternating Coag, Cut and break phases | 1 2 3 4 5 6 7 8 9 | - | 750 Vp | 5 | --- |
| GastroLOOP 2 | Yes | Yes | sinusoidal alternating Coag, Cut and break phases | 1 2 3 4 5 6 7 8 9 | - | 750 Vp | 5 | --- |

| Description | CCS | ARC CONTROL | Form of HF voltage | Max. power output | | Peak voltage | Default values | |
|------------------------------------|-----|-------------|---|-------------------|-------------|--|----------------|-----------|
| | | | | Effect | Power range | | Effect | Max. Watt |
| Modes Monopolar Cutting | | | | | | | | |
| GastroLOOP 3 | Yes | Yes | sinusoidal alternating Coag, Cut and break phases | 1 | - | 750 Vp | 5 | --- |
| | | | | 2 | | | | |
| | | | | 3 | | | | |
| | | | | 4 | | | | |
| | | | | 5 | | | | |
| | | | | 6 | | | | |
| | | | | 7 | | | | |
| | | | | 8 | | | | |
| | | | | 9 | | | | |
| GastroKNIFE 1 | Yes | Yes | sinusoidal alternating Coag and Cut phases | 1 | - | 650 Vp | 5 | --- |
| | | | | 2 | | | | |
| | | | | 3 | | | | |
| | | | | 4 | | | | |
| | | | | 5 | | | | |
| | | | | 6 | | | | |
| | | | | 7 | | | | |
| | | | | 8 | | | | |
| | | | | 9 | | | | |
| GastroKNIFE 2 | Yes | Yes | sinusoidal alternating Coag and Cut phases | 1 | - | 650 Vp | 5 | --- |
| | | | | 2 | | | | |
| | | | | 3 | | | | |
| | | | | 4 | | | | |
| | | | | 5 | | | | |
| | | | | 6 | | | | |
| | | | | 7 | | | | |
| | | | | 8 | | | | |
| | | | | 9 | | | | |
| GastroKNIFE 3 | Yes | Yes | sinusoidal alternating Coag and Cut phases | 1 | - | 650 Vp | 5 | --- |
| | | | | 2 | | | | |
| | | | | 3 | | | | |
| | | | | 4 | | | | |
| | | | | 5 | | | | |
| | | | | 6 | | | | |
| | | | | 7 | | | | |
| | | | | 8 | | | | |
| | | | | 9 | | | | |
| Modes Monopolar Coagulation | | | | | | | | |
| Moderate | | | sinusoidal constant | 1 2 3 | 1 W - 120 W | 250 Vp | 2 | 60 |
| Forced non cutting | | | pulsed modulated | - | 1 W - 80 W | 3.5 kVp | --- | 50 |
| Forced mixed | | | sinusoidal modulated | 1 2 3 | 1 W - 120 W | 2.3 kVp 2.5 kVp 2.8 kVp | 2 | 60 |
| Forced cutting | | | sinusoidal modulated | 1 2 3 4 | 1 W - 250 W | 1.5 kVp 1.5 kVp 1.3 kVp 1.3 kVp | 2 | 80 |
| Spray | | | pulsed modulated | 1 2 3 4 | 1 W - 120 W | 3.0 kVp 3.8 kVp 4.6 kVp 5.0 kVp | 2 | 80 |
| Argon open | | | pulsed modulated | - | 1 W - 120 W | 4.6 kVp | --- | 80 |
| Argon flexible | | | pulsed modulated | - | 1 W - 120 W | 4.4 kVp | --- | 40 |

| Description | CCS | ARC CONTROL | Form of HF voltage | Max. power output | | Peak voltage | Default values | |
|------------------------------------|-----|-------------|--|-------------------|-------------|-------------------------------|----------------|-----------|
| | | | | Effect | Power range | | Effect | Max. Watt |
| Modes Monopolar Coagulation | | | | | | | | |
| Argon flex. pulse | | | pulsed modulated | 1 2 3 | 1 W – 80 W | 4.4 kVp | 2 | 20 |
| Resection | | | sinusoidal modulated | - | 1 W -120 W | 2.6 kVp | --- | 60 |
| Cardiac Mammary | | | sinusoidal modulated | - | 1 W - 60 W | 2.3 kVp | --- | 15 |
| Cardiac Thorax | | | sinusoidal modulated | - | 1 W - 100 W | 2.3 kVp | --- | 40 |
| SimCoag | | | sinusoidal modulated pulsed modulated pulsed modulated | 1 2 3 | 1 W - 120 W | 1.5 kVp 2.3 kVp 4.6 kVp | 2 | 60 |
| Gastro Coag | | | sinusoidal modulated | 1 2 3 | 1 W - 50 W | 2.3 kVp 2.6 kVp 3.1 kVp | 2 | 15 |
| Laparoscopy | | | sinusoidal modulated | - | 1 W - 120 W | 1.8 kVp | --- | 60 |
| Modes Bipolar Cutting | | | | | | | | |
| Standard | Yes | Yes | sinusoidal constant | - | 1 W - 200 W | 400 Vp | --- | 100 |
| Bipolar resection | Yes | Yes | sinusoidal constant | 1 2 3 | 250 W | 500 Vp | 2 | --- |
| Bipolar scissors | | | sinusoidal constant | - | 1 W - 120 W | 200 Vp | --- | 60 |
| Modes Bipolar Coagulation | | | | | | | | |
| Standard forceps | | | sinusoidal constant | - | 1 W - 120 W | 150 Vp | --- | 40 |
| Standard forceps AUTO | | | sinusoidal constant | - | 5 W - 120 W | 150 Vp | --- | 40 |

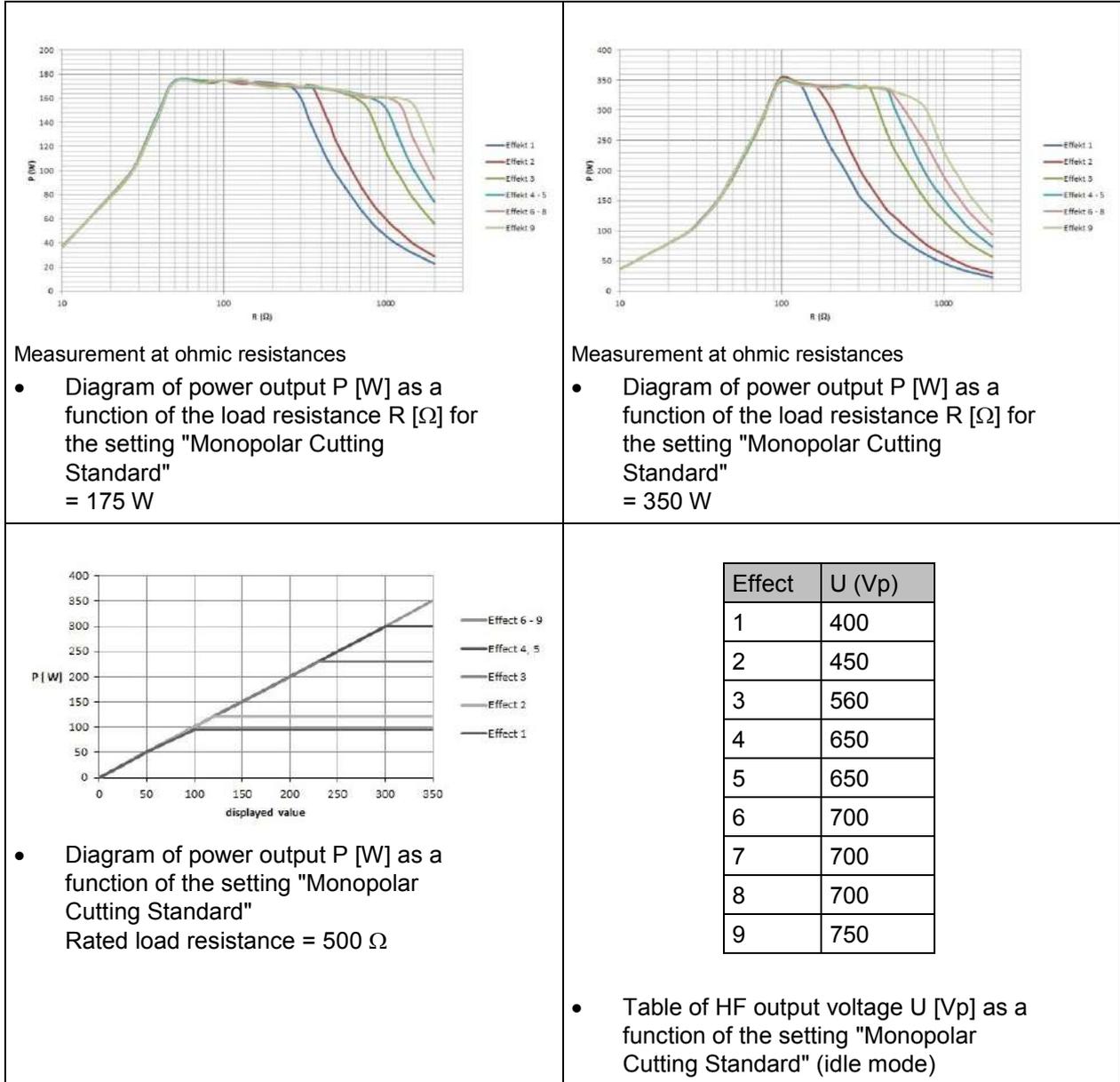
| Description | CCS | ARC CONTROL | Form of HF voltage | Max. power output | | Peak voltage | Default values | |
|----------------------------------|-----|-------------|----------------------|-------------------|--------------|--------------|----------------|-----------|
| | | | | Effect | Power range | | Effect | Max. Watt |
| Modes Bipolar Coagulation | | | | | | | | |
| Micro forceps | | | sinusoidal constant | - | 0.1 W - 20 W | 150 Vp | --- | 10 |
| Forceps forced | | | sinusoidal modulated | - | 1 W - 100 W | 550 Vp | --- | 70 |
| LIGATION | | | sinusoidal modulated | - | 200 W | 190 Vp | --- | --- |
| TissueSeal PLUS | | | sinusoidal modulated | - | 200 W | 190 Vp | --- | --- |
| Bipolar scissors | | | sinusoidal constant | - | 1 W - 120 W | 200 Vp | --- | 60 |
| Laparoscopy | | | sinusoidal constant | - | 1 W - 120 W | 150 Vp | --- | 50 |
| Bipolar resection | | | sinusoidal constant | - | 1 W - 350 W | 190 Vp | --- | 200 |



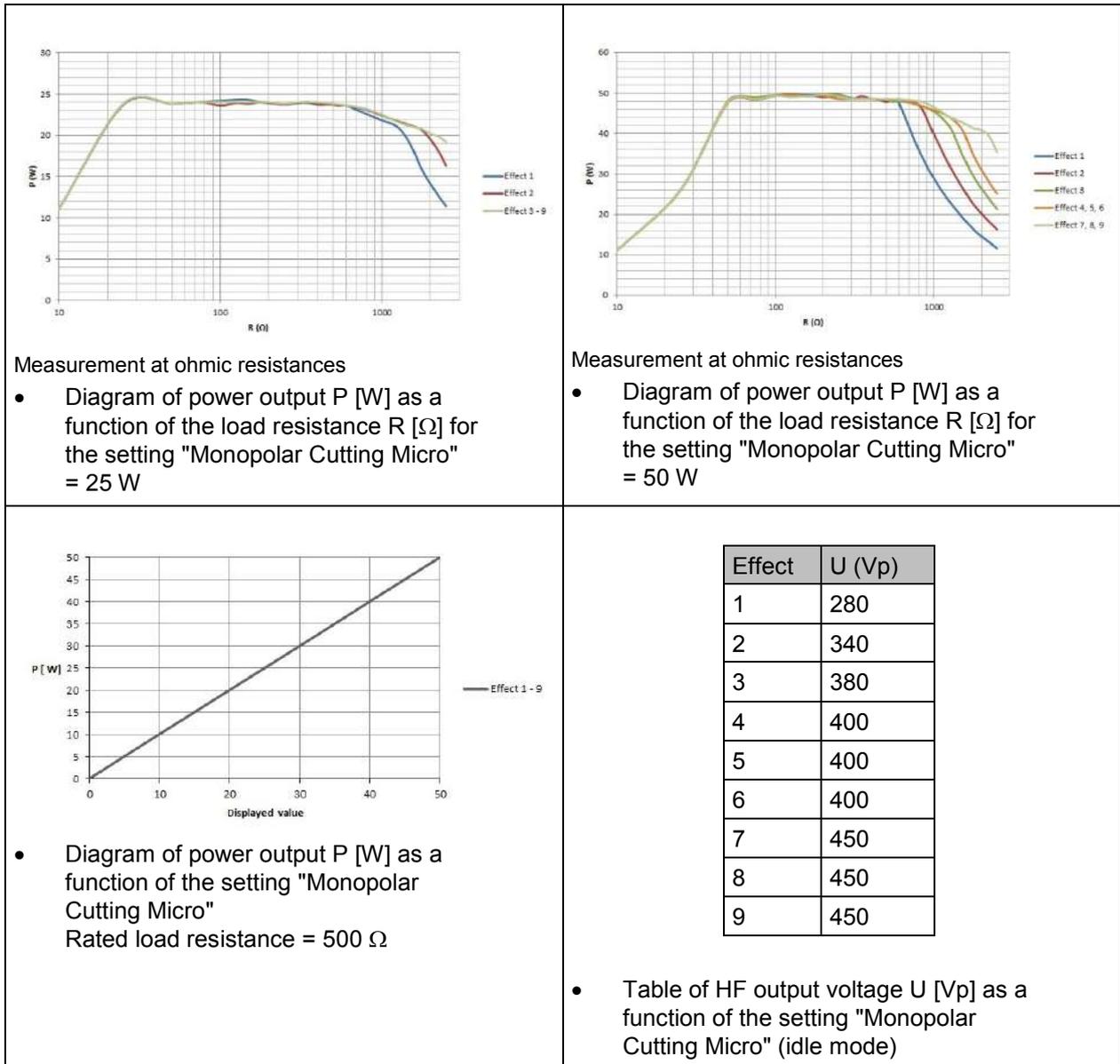
The max. values are not necessarily created at rated load resistance.
 The HF power is subject to a tolerance limit of $\pm 20\%$.

10.2. Output, voltage and current diagrams

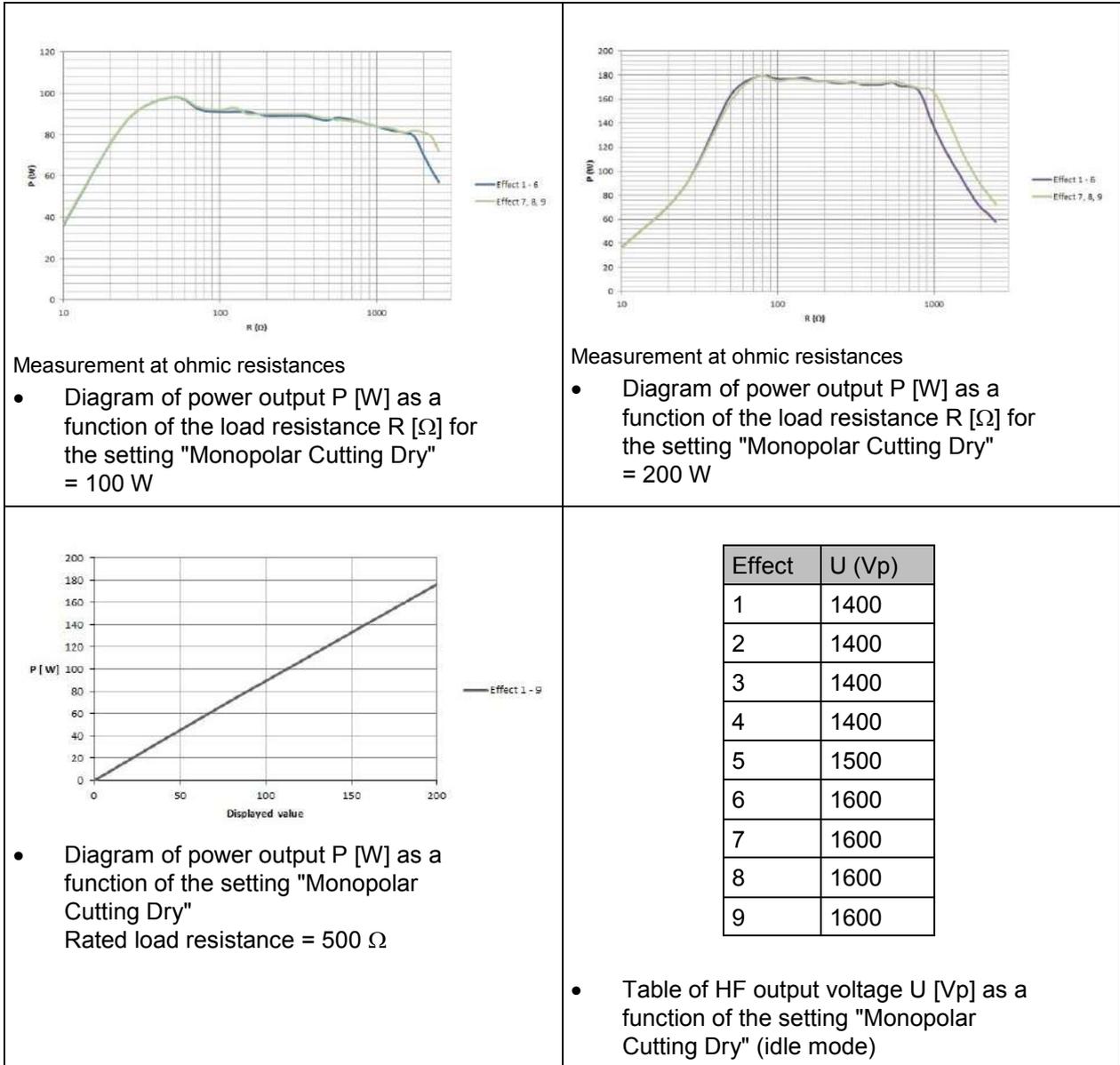
Monopolar Cutting – Standard



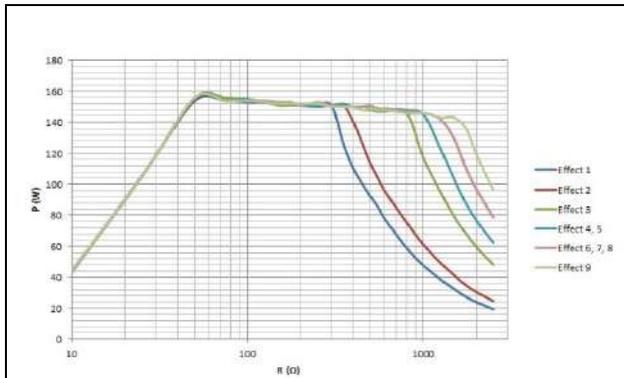
Monopolar Cutting – Micro



Monopolar Cutting – Dry

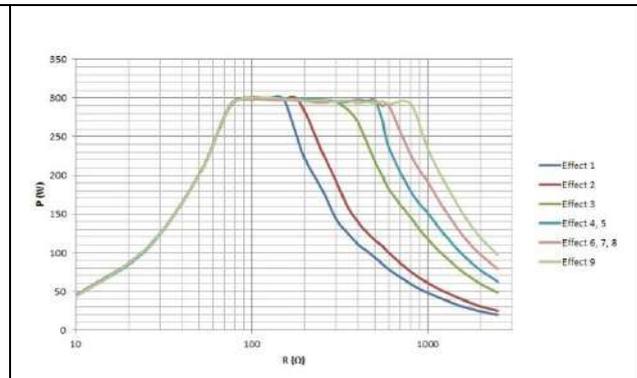


Monopolar Cutting – Argon



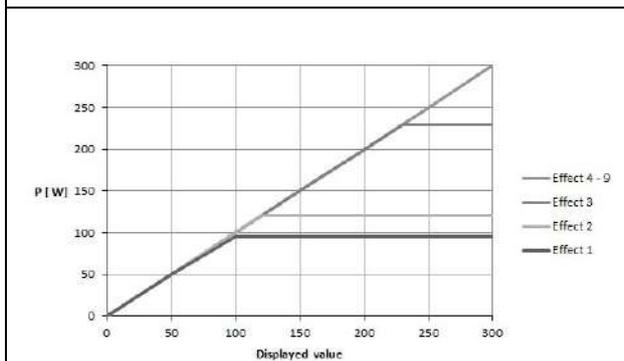
Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting Argon" = 150 W



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting Argon" = 300 W



- Diagram of power output P [W] as a function of the setting "Monopolar Cutting Argon" Rated load resistance= 500 Ω

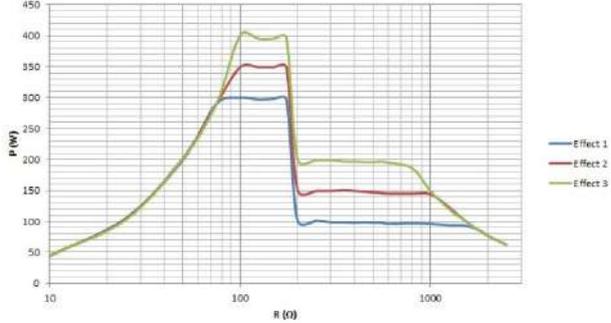
| Effect | U (Vp) |
|--------|--------|
| 1 | 400 |
| 2 | 450 |
| 3 | 560 |
| 4 | 650 |
| 5 | 650 |
| 6 | 700 |
| 7 | 700 |
| 8 | 700 |
| 9 | 750 |

- Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting Argon" (idle mode)

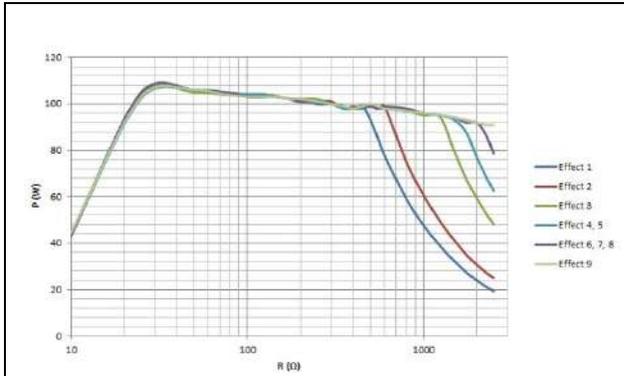
Monopolar Cutting – Resection

| <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting Resection" | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--------|-------|---|-----|---|-----|---|-----|---|-----|---|-----|---|--------|--------|---|-----|---|-----|---|-----|---|-----|---|-----|
| <table border="1" data-bbox="384 952 635 1216"> <thead> <tr> <th>Effect</th> <th>P (W)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>250</td> </tr> <tr> <td>2</td> <td>250</td> </tr> <tr> <td>3</td> <td>250</td> </tr> <tr> <td>4</td> <td>250</td> </tr> <tr> <td>5</td> <td>250</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Table of power output P [W] as a function of the setting "Monopolar Cutting Resection" Rated load resistance= 500 Ω | Effect | P (W) | 1 | 250 | 2 | 250 | 3 | 250 | 4 | 250 | 5 | 250 | <table border="1" data-bbox="1010 952 1259 1216"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>650</td> </tr> <tr> <td>2</td> <td>700</td> </tr> <tr> <td>3</td> <td>700</td> </tr> <tr> <td>4</td> <td>700</td> </tr> <tr> <td>5</td> <td>750</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting Resection" (idle mode) | Effect | U (Vp) | 1 | 650 | 2 | 700 | 3 | 700 | 4 | 700 | 5 | 750 |
| Effect | P (W) | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 250 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 250 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 250 | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 250 | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 250 | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 650 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 700 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 700 | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 700 | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 750 | | | | | | | | | | | | | | | | | | | | | | | | |

Monopolar Cutting – MetraLOOP

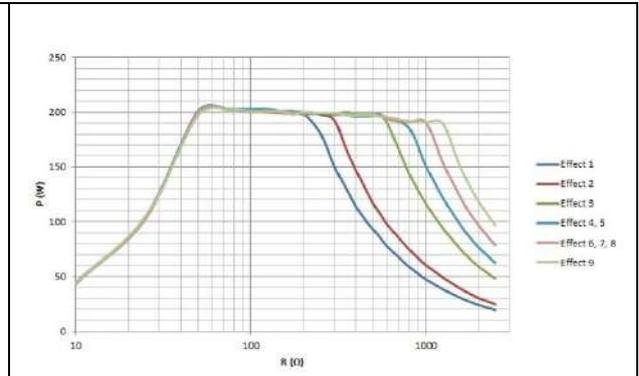
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting MetraLOOP" | <ul style="list-style-type: none"> • | | | | | | | | | | | | | | | | |
|---|---|-------|---|-----|---|-----|---|-----|---|--------|--------|---|-----|---|-----|---|-----|
| <table border="1" data-bbox="384 965 632 1111"> <thead> <tr> <th>Effect</th> <th>P (W)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>100</td> </tr> <tr> <td>2</td> <td>150</td> </tr> <tr> <td>3</td> <td>200</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Table of power output P [W] as a function of the setting "Monopolar Cutting MetraLOOP" Rated load resistance= 500 Ω | Effect | P (W) | 1 | 100 | 2 | 150 | 3 | 200 | <table border="1" data-bbox="1011 965 1259 1111"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>650</td> </tr> <tr> <td>2</td> <td>650</td> </tr> <tr> <td>3</td> <td>650</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting MetraLOOP" (idle mode) | Effect | U (Vp) | 1 | 650 | 2 | 650 | 3 | 650 |
| Effect | P (W) | | | | | | | | | | | | | | | | |
| 1 | 100 | | | | | | | | | | | | | | | | |
| 2 | 150 | | | | | | | | | | | | | | | | |
| 3 | 200 | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | |
| 1 | 650 | | | | | | | | | | | | | | | | |
| 2 | 650 | | | | | | | | | | | | | | | | |
| 3 | 650 | | | | | | | | | | | | | | | | |

Monopolar Cutting – Laparoscopy



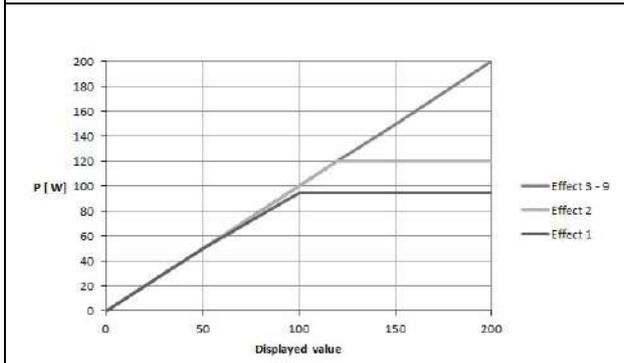
Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting Laparoscopy" = 100 W



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting Laparoscopy" = 200 W

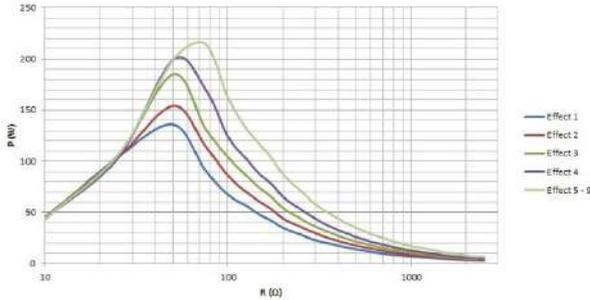
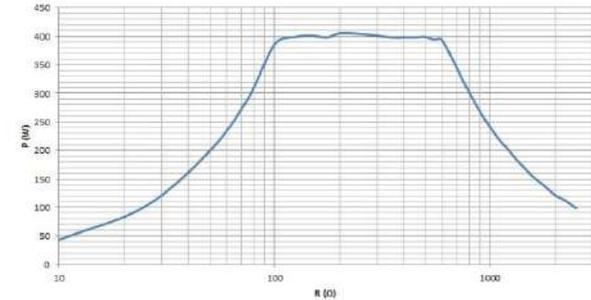


- Diagram of power output P [W] as a function of the setting "Monopolar Cutting Laparoscopy" Rated load resistance= 500 Ω

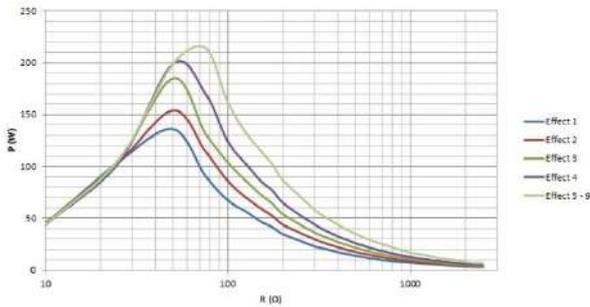
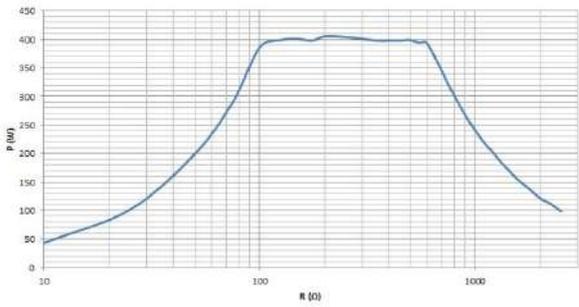
| Effect | U [Vp] |
|--------|--------|
| 1 | 400 |
| 2 | 450 |
| 3 | 560 |
| 4 | 650 |
| 5 | 650 |
| 6 | 700 |
| 7 | 700 |
| 8 | 700 |
| 9 | 750 |

- Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting Laparoscopy" (idle mode)

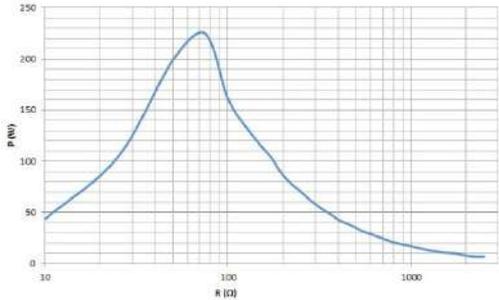
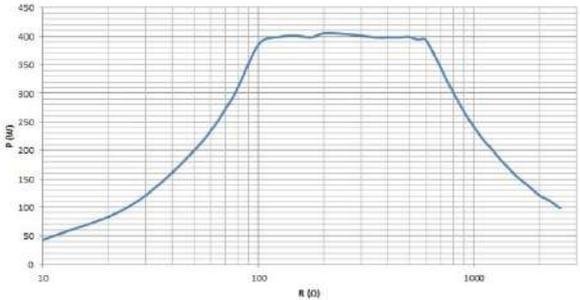
Monopolar Cutting – GastroLOOP 1

|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroLOOP 1" coag phase |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroLOOP 1" cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---------------------|--------------------|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|--|--------|--------|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>P (W) coag phase</th> <th>P (W) cut phase</th> </tr> </thead> <tbody> <tr><td>1</td><td>14</td><td>400</td></tr> <tr><td>2</td><td>18</td><td>400</td></tr> <tr><td>3</td><td>22</td><td>400</td></tr> <tr><td>4</td><td>26</td><td>400</td></tr> <tr><td>5</td><td>35</td><td>400</td></tr> <tr><td>6</td><td>35</td><td>400</td></tr> <tr><td>7</td><td>35</td><td>400</td></tr> <tr><td>8</td><td>35</td><td>400</td></tr> <tr><td>9</td><td>35</td><td>400</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of power output P [W] as a function of the setting "Monopolar Cutting GastroLOOP 1" Rated load resistance= 500 Ω | Effect | P (W) coag phase | P (W) cut phase | 1 | 14 | 400 | 2 | 18 | 400 | 3 | 22 | 400 | 4 | 26 | 400 | 5 | 35 | 400 | 6 | 35 | 400 | 7 | 35 | 400 | 8 | 35 | 400 | 9 | 35 | 400 | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr><td>1</td><td>750</td></tr> <tr><td>2</td><td>750</td></tr> <tr><td>3</td><td>750</td></tr> <tr><td>4</td><td>750</td></tr> <tr><td>5</td><td>750</td></tr> <tr><td>6</td><td>750</td></tr> <tr><td>7</td><td>750</td></tr> <tr><td>8</td><td>750</td></tr> <tr><td>9</td><td>750</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting GastroLOOP 1" (idle mode) | Effect | U (Vp) | 1 | 750 | 2 | 750 | 3 | 750 | 4 | 750 | 5 | 750 | 6 | 750 | 7 | 750 | 8 | 750 | 9 | 750 |
| Effect | P (W) coag phase | P (W) cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 14 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 18 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 22 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 26 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

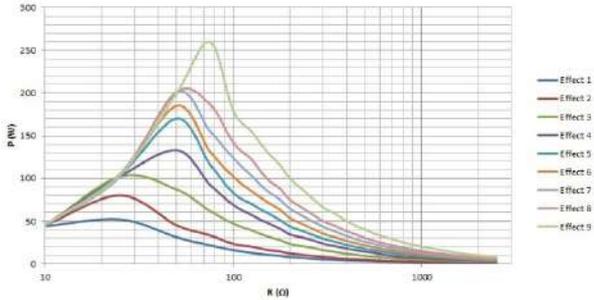
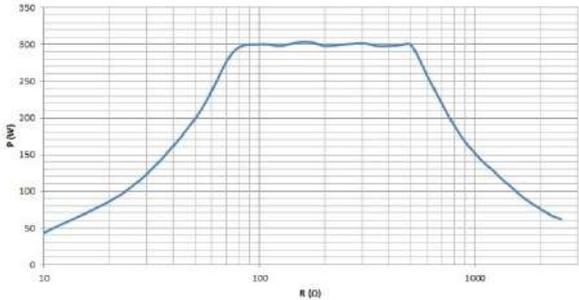
Monopolar Cutting – GastroLOOP 2

|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroLOOP 2" coag phase |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroLOOP 2" cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|------------------|-----------------|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|--|--------|--------|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|
| <table border="1" data-bbox="255 920 700 1391"> <thead> <tr> <th>Effect</th> <th>P (W) coag phase</th> <th>P (W) cut phase</th> </tr> </thead> <tbody> <tr><td>1</td><td>14</td><td>400</td></tr> <tr><td>2</td><td>18</td><td>400</td></tr> <tr><td>3</td><td>22</td><td>400</td></tr> <tr><td>4</td><td>26</td><td>400</td></tr> <tr><td>5</td><td>35</td><td>400</td></tr> <tr><td>6</td><td>35</td><td>400</td></tr> <tr><td>7</td><td>35</td><td>400</td></tr> <tr><td>8</td><td>35</td><td>400</td></tr> <tr><td>9</td><td>35</td><td>400</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of power output P [W] as a function of the setting "Monopolar Cutting GastroLOOP 2" Rated load resistance= 500 Ω | Effect | P (W) coag phase | P (W) cut phase | 1 | 14 | 400 | 2 | 18 | 400 | 3 | 22 | 400 | 4 | 26 | 400 | 5 | 35 | 400 | 6 | 35 | 400 | 7 | 35 | 400 | 8 | 35 | 400 | 9 | 35 | 400 | <table border="1" data-bbox="991 920 1214 1359"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr><td>1</td><td>750</td></tr> <tr><td>2</td><td>750</td></tr> <tr><td>3</td><td>750</td></tr> <tr><td>4</td><td>750</td></tr> <tr><td>5</td><td>750</td></tr> <tr><td>6</td><td>750</td></tr> <tr><td>7</td><td>750</td></tr> <tr><td>8</td><td>750</td></tr> <tr><td>9</td><td>750</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting GastroLOOP 2" (idle mode) | Effect | U (Vp) | 1 | 750 | 2 | 750 | 3 | 750 | 4 | 750 | 5 | 750 | 6 | 750 | 7 | 750 | 8 | 750 | 9 | 750 |
| Effect | P (W) coag phase | P (W) cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 14 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 18 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 22 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 26 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

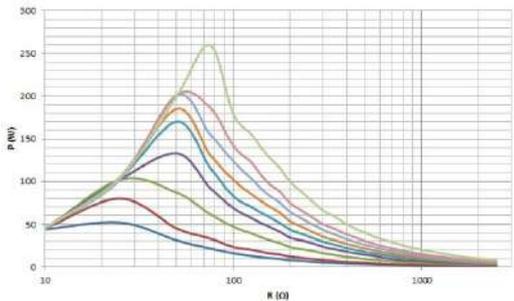
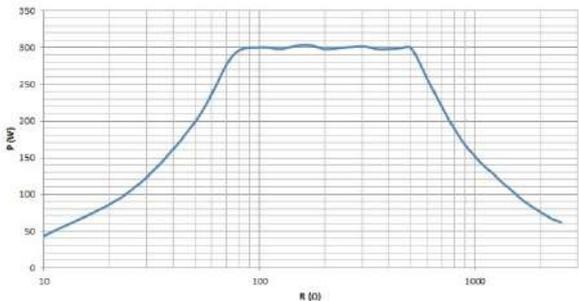
Monopolar Cutting – GastroLOOP 3

|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroLOOP 3" coag phase |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroLOOP 3" cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|------------------|-----------------|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|--|--------|--------|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|
| <table border="1" data-bbox="256 965 700 1435"> <thead> <tr> <th>Effect</th> <th>P (W) coag phase</th> <th>P (W) cut phase</th> </tr> </thead> <tbody> <tr><td>1</td><td>35</td><td>400</td></tr> <tr><td>2</td><td>35</td><td>400</td></tr> <tr><td>3</td><td>35</td><td>400</td></tr> <tr><td>4</td><td>35</td><td>400</td></tr> <tr><td>5</td><td>35</td><td>400</td></tr> <tr><td>6</td><td>35</td><td>400</td></tr> <tr><td>7</td><td>35</td><td>400</td></tr> <tr><td>8</td><td>35</td><td>400</td></tr> <tr><td>9</td><td>35</td><td>400</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of power output P [W] as a function of the setting "Monopolar Cutting GastroLOOP 3" Rated load resistance= 500 Ω | Effect | P (W) coag phase | P (W) cut phase | 1 | 35 | 400 | 2 | 35 | 400 | 3 | 35 | 400 | 4 | 35 | 400 | 5 | 35 | 400 | 6 | 35 | 400 | 7 | 35 | 400 | 8 | 35 | 400 | 9 | 35 | 400 | <table border="1" data-bbox="994 965 1214 1402"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr><td>1</td><td>750</td></tr> <tr><td>2</td><td>750</td></tr> <tr><td>3</td><td>750</td></tr> <tr><td>4</td><td>750</td></tr> <tr><td>5</td><td>750</td></tr> <tr><td>6</td><td>750</td></tr> <tr><td>7</td><td>750</td></tr> <tr><td>8</td><td>750</td></tr> <tr><td>9</td><td>750</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting GastroLOOP 3" (idle mode) | Effect | U (Vp) | 1 | 750 | 2 | 750 | 3 | 750 | 4 | 750 | 5 | 750 | 6 | 750 | 7 | 750 | 8 | 750 | 9 | 750 |
| Effect | P (W) coag phase | P (W) cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 35 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

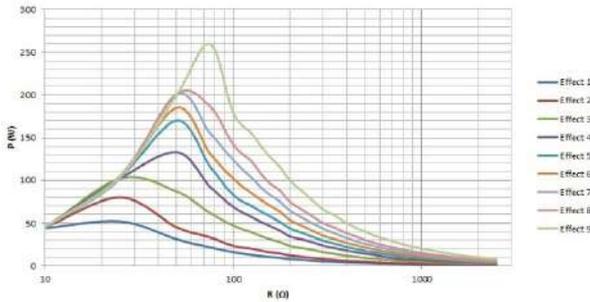
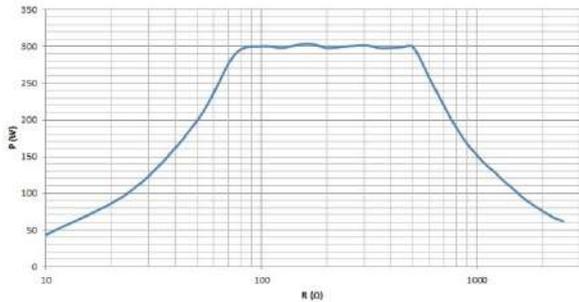
Monopolar Cutting – GastroKNIFE 1

|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroKNIFE 1" coag phase |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroKNIFE 1" cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---------------------|--------------------|---|---|-----|---|---|-----|---|---|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|--------|--------|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>P (W) coag phase</th> <th>P (W) cut phase</th> </tr> </thead> <tbody> <tr><td>1</td><td>3</td><td>300</td></tr> <tr><td>2</td><td>5</td><td>300</td></tr> <tr><td>3</td><td>9</td><td>300</td></tr> <tr><td>4</td><td>14</td><td>300</td></tr> <tr><td>5</td><td>17</td><td>300</td></tr> <tr><td>6</td><td>22</td><td>300</td></tr> <tr><td>7</td><td>26</td><td>300</td></tr> <tr><td>8</td><td>30</td><td>300</td></tr> <tr><td>9</td><td>40</td><td>300</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of power output P [W] as a function of the setting "Monopolar Cutting GastroKNIFE 1" Rated load resistance= 500 Ω | Effect | P (W) coag phase | P (W) cut phase | 1 | 3 | 300 | 2 | 5 | 300 | 3 | 9 | 300 | 4 | 14 | 300 | 5 | 17 | 300 | 6 | 22 | 300 | 7 | 26 | 300 | 8 | 30 | 300 | 9 | 40 | 300 | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr><td>1</td><td>650</td></tr> <tr><td>2</td><td>650</td></tr> <tr><td>3</td><td>650</td></tr> <tr><td>4</td><td>650</td></tr> <tr><td>5</td><td>650</td></tr> <tr><td>6</td><td>650</td></tr> <tr><td>7</td><td>650</td></tr> <tr><td>8</td><td>650</td></tr> <tr><td>9</td><td>650</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting GastroKNIFE 1" (idle mode) | Effect | U (Vp) | 1 | 650 | 2 | 650 | 3 | 650 | 4 | 650 | 5 | 650 | 6 | 650 | 7 | 650 | 8 | 650 | 9 | 650 |
| Effect | P (W) coag phase | P (W) cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 3 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 5 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 9 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 14 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 17 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 22 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 26 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 30 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 40 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

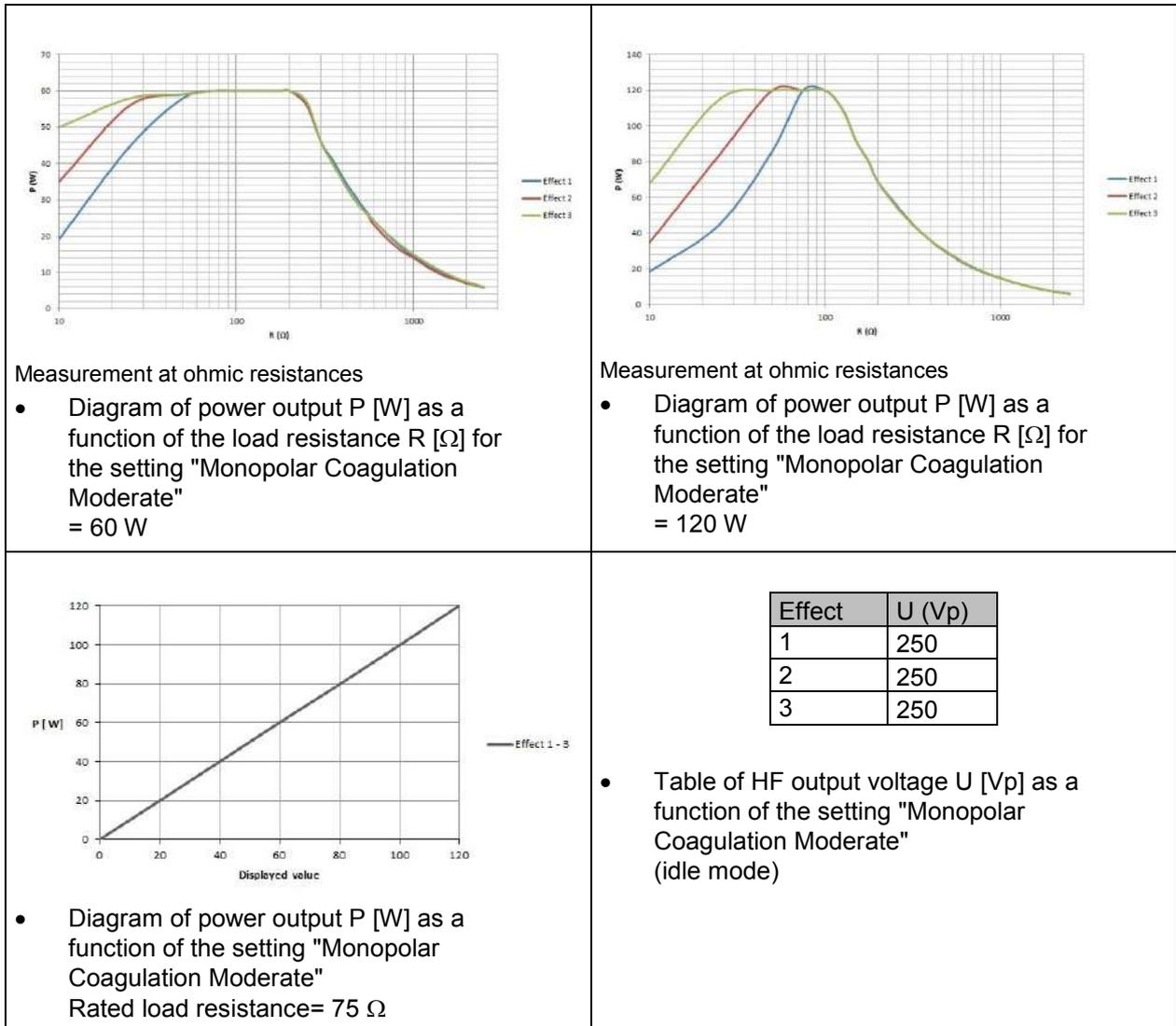
Monopolar Cutting – GastroKNIFE 2

|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroKNIFE 2" coag phase |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroKNIFE 2" cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|------------------|-----------------|---|---|-----|---|---|-----|---|---|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|--------|--------|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>P (W) coag phase</th> <th>P (W) cut phase</th> </tr> </thead> <tbody> <tr><td>1</td><td>3</td><td>300</td></tr> <tr><td>2</td><td>5</td><td>300</td></tr> <tr><td>3</td><td>9</td><td>300</td></tr> <tr><td>4</td><td>14</td><td>300</td></tr> <tr><td>5</td><td>17</td><td>300</td></tr> <tr><td>6</td><td>22</td><td>300</td></tr> <tr><td>7</td><td>26</td><td>300</td></tr> <tr><td>8</td><td>30</td><td>300</td></tr> <tr><td>9</td><td>40</td><td>300</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of power output P [W] as a function of the setting "Monopolar Cutting GastroKNIFE 2" Rated load resistance= 500 Ω | Effect | P (W) coag phase | P (W) cut phase | 1 | 3 | 300 | 2 | 5 | 300 | 3 | 9 | 300 | 4 | 14 | 300 | 5 | 17 | 300 | 6 | 22 | 300 | 7 | 26 | 300 | 8 | 30 | 300 | 9 | 40 | 300 | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr><td>1</td><td>650</td></tr> <tr><td>2</td><td>650</td></tr> <tr><td>3</td><td>650</td></tr> <tr><td>4</td><td>650</td></tr> <tr><td>5</td><td>650</td></tr> <tr><td>6</td><td>650</td></tr> <tr><td>7</td><td>650</td></tr> <tr><td>8</td><td>650</td></tr> <tr><td>9</td><td>650</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting GastroKNIFE 2" (idle mode) | Effect | U (Vp) | 1 | 650 | 2 | 650 | 3 | 650 | 4 | 650 | 5 | 650 | 6 | 650 | 7 | 650 | 8 | 650 | 9 | 650 |
| Effect | P (W) coag phase | P (W) cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 3 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 5 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 9 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 14 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 17 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 22 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 26 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 30 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 40 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

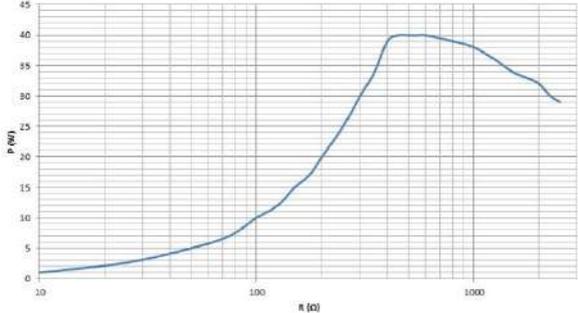
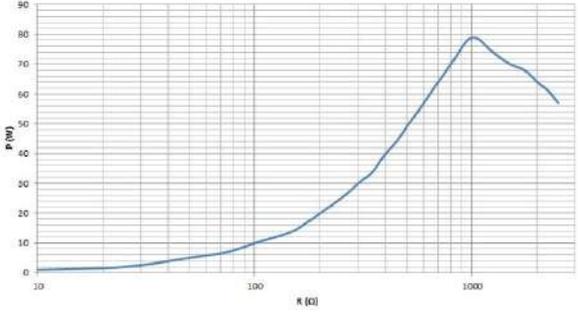
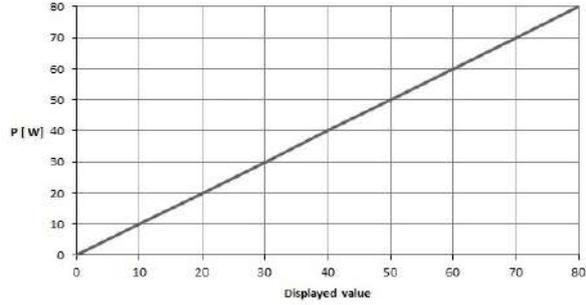
Monopolar Cutting – GastroKNIFE 3

|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroKNIFE 3" coag phase |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Cutting GastroKNIFE 3" cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---------------------|--------------------|---|---|-----|---|---|-----|---|---|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|----|-----|---|--------|--------|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>P (W) coag phase</th> <th>P (W) cut phase</th> </tr> </thead> <tbody> <tr><td>1</td><td>3</td><td>300</td></tr> <tr><td>2</td><td>5</td><td>300</td></tr> <tr><td>3</td><td>9</td><td>300</td></tr> <tr><td>4</td><td>14</td><td>300</td></tr> <tr><td>5</td><td>17</td><td>300</td></tr> <tr><td>6</td><td>22</td><td>300</td></tr> <tr><td>7</td><td>26</td><td>300</td></tr> <tr><td>8</td><td>30</td><td>300</td></tr> <tr><td>9</td><td>40</td><td>300</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of power output P [W] as a function of the setting "Monopolar Cutting GastroKNIFE 3" Rated load resistance= 500 Ω | Effect | P (W) coag phase | P (W) cut phase | 1 | 3 | 300 | 2 | 5 | 300 | 3 | 9 | 300 | 4 | 14 | 300 | 5 | 17 | 300 | 6 | 22 | 300 | 7 | 26 | 300 | 8 | 30 | 300 | 9 | 40 | 300 | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Effect</th> <th>U (Vp)</th> </tr> </thead> <tbody> <tr><td>1</td><td>650</td></tr> <tr><td>2</td><td>650</td></tr> <tr><td>3</td><td>650</td></tr> <tr><td>4</td><td>650</td></tr> <tr><td>5</td><td>650</td></tr> <tr><td>6</td><td>650</td></tr> <tr><td>7</td><td>650</td></tr> <tr><td>8</td><td>650</td></tr> <tr><td>9</td><td>650</td></tr> </tbody> </table> <ul style="list-style-type: none"> Table of HF output voltage U [Vp] as a function of the setting "Monopolar Cutting GastroKNIFE 3" (idle mode) | Effect | U (Vp) | 1 | 650 | 2 | 650 | 3 | 650 | 4 | 650 | 5 | 650 | 6 | 650 | 7 | 650 | 8 | 650 | 9 | 650 |
| Effect | P (W) coag phase | P (W) cut phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 3 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 5 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 9 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 14 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 17 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 22 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 26 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 30 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 40 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect | U (Vp) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

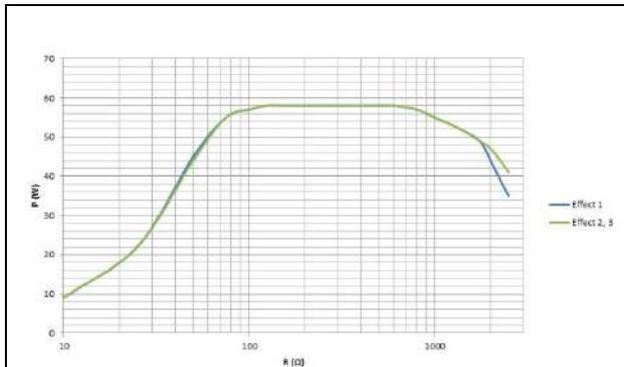
Monopolar Coagulation – Moderate



Monopolar Coagulation – Forced non cutting

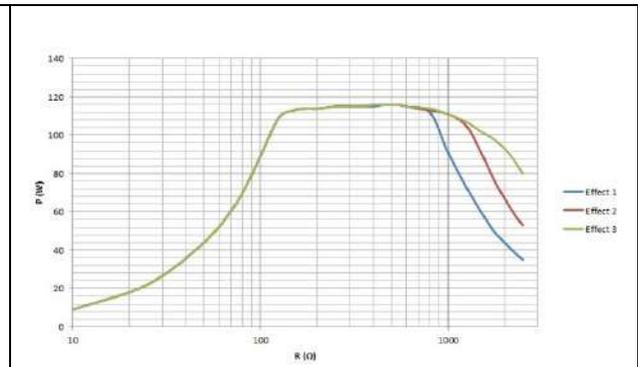
| | |
|--|---|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Forced non cutting" = 40 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Forced non cutting" = 80 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Forced non cutting" Rated load resistance = 1000 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting "Monopolar Coagulation Moderate" (idle mode) = 3500 Vp |

Monopolar Coagulation – Forced mixed



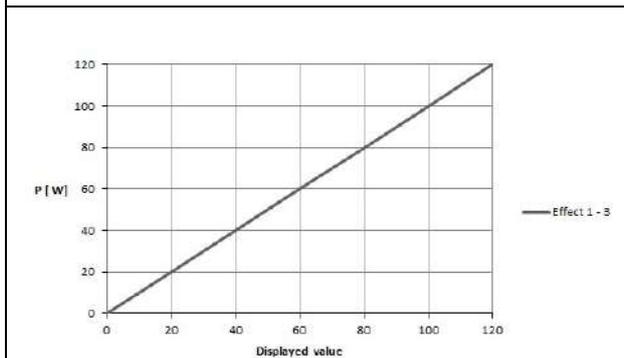
Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Forced mixed" = 60 W



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Forced mixed" = 120 W

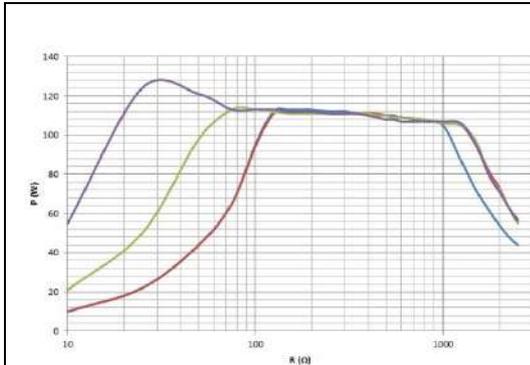


- Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Forced mixed" Rated load resistance = 500 Ω

| Effect | U (Vp) |
|--------|--------|
| 1 | 2300 |
| 2 | 2500 |
| 3 | 2800 |

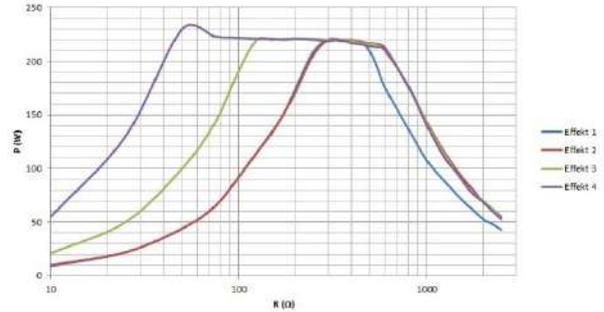
- Table of HF output voltage U [Vp] as a function of the setting "Monopolar Coagulation Forced mixed" (idle mode)

Monopolar Coagulation – Forced cutting



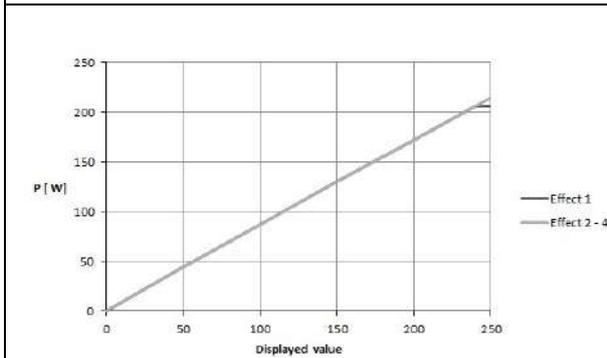
Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Forced cutting" = 125 W



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Forced cutting" = 250 W

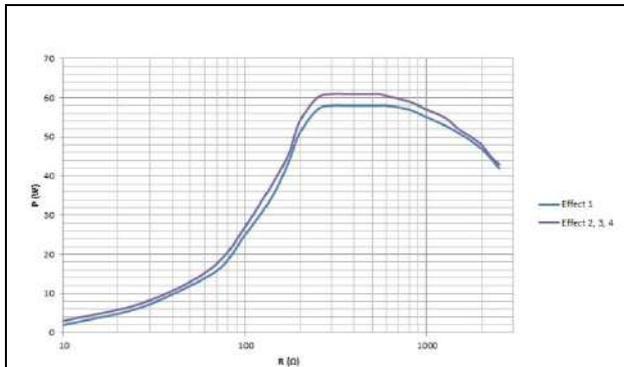


- Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Forced cutting" Rated load resistance = 500 Ω

| Effect | U (Vp) |
|--------|--------|
| 1 | 1500 |
| 2 | 1500 |
| 3 | 1300 |
| 4 | 1300 |

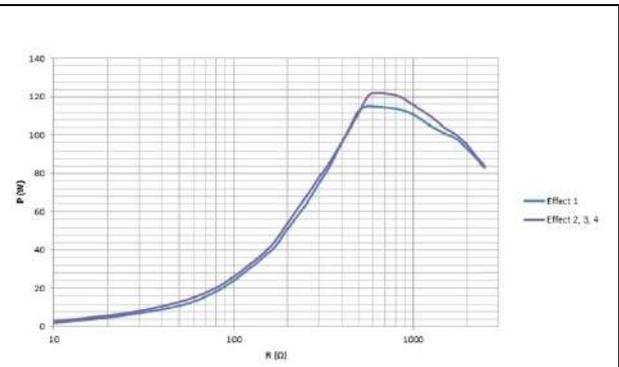
- Table of HF output voltage U [Vp] as a function of the setting "Monopolar Coagulation Forced cutting" (idle mode)

Monopolar Coagulation – Spray



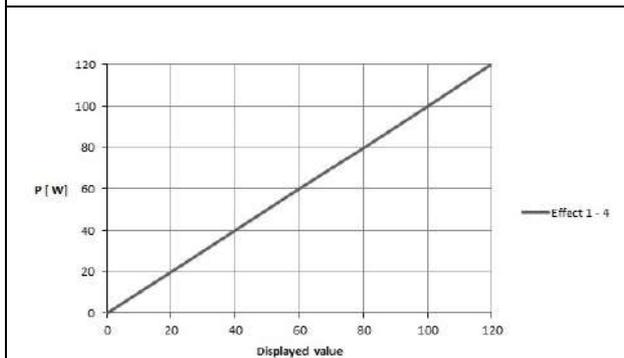
Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Spray" = 60 W



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Spray" = 120 W

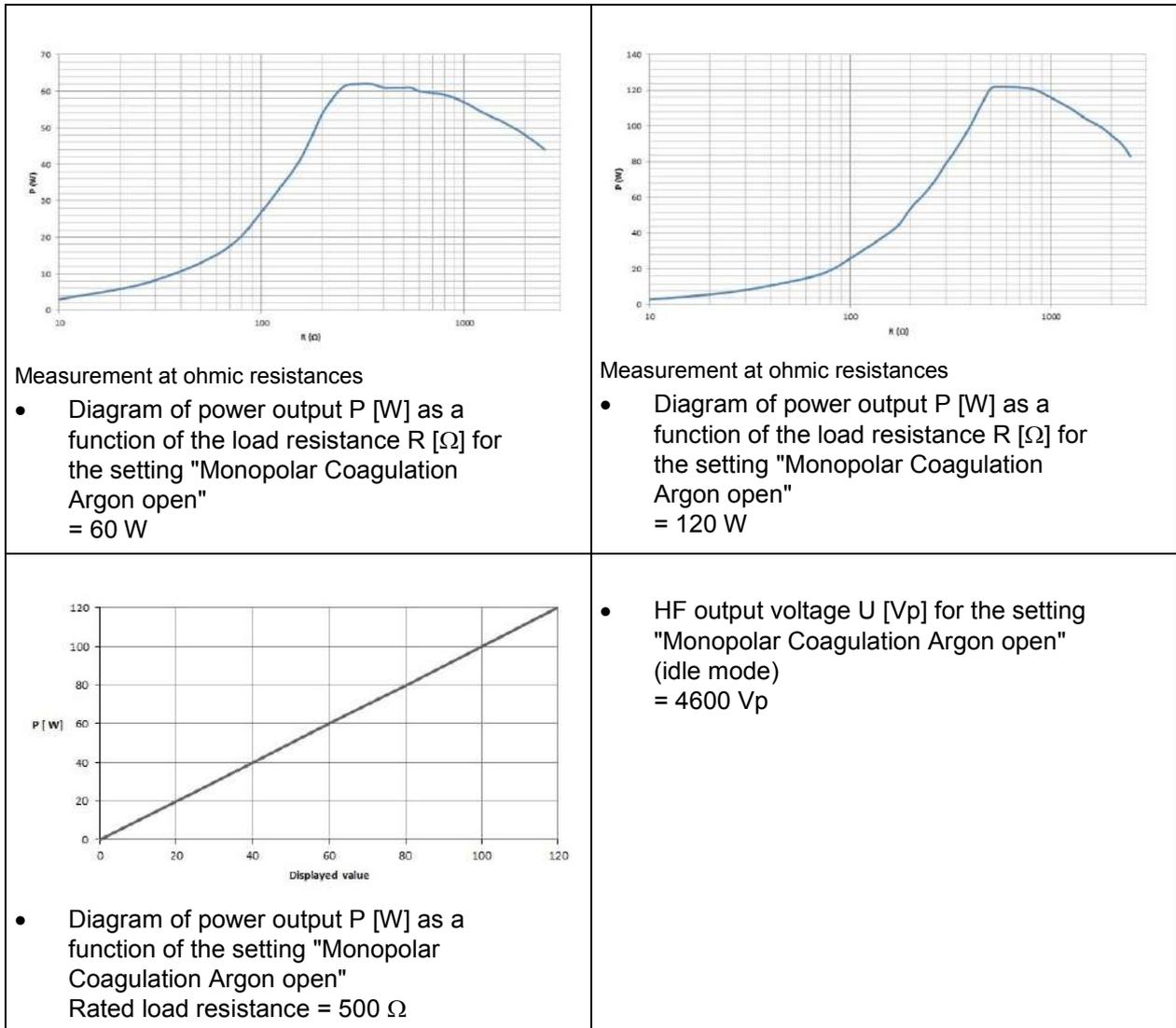


- Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Spray" Rated load resistance = 500 Ω

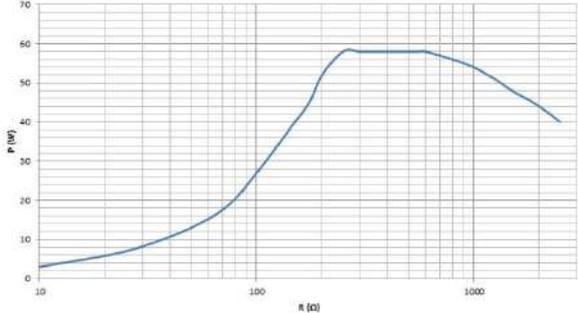
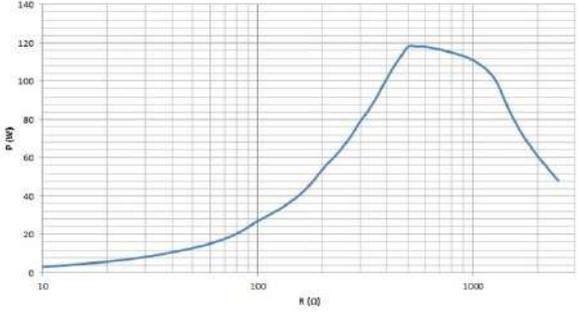
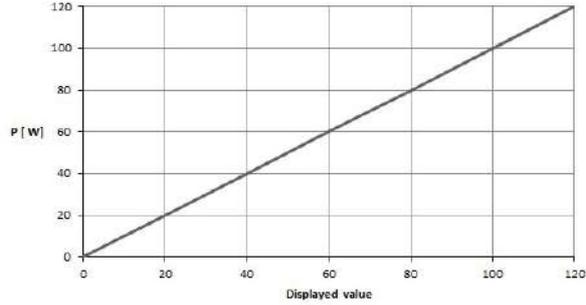
| Effect | U (Vp) |
|--------|--------|
| 1 | 3000 |
| 2 | 3800 |
| 3 | 4600 |
| 4 | 5000 |

- Table of HF output voltage U [Vp] as a function of the setting "Monopolar Coagulation Spray" (idle mode)

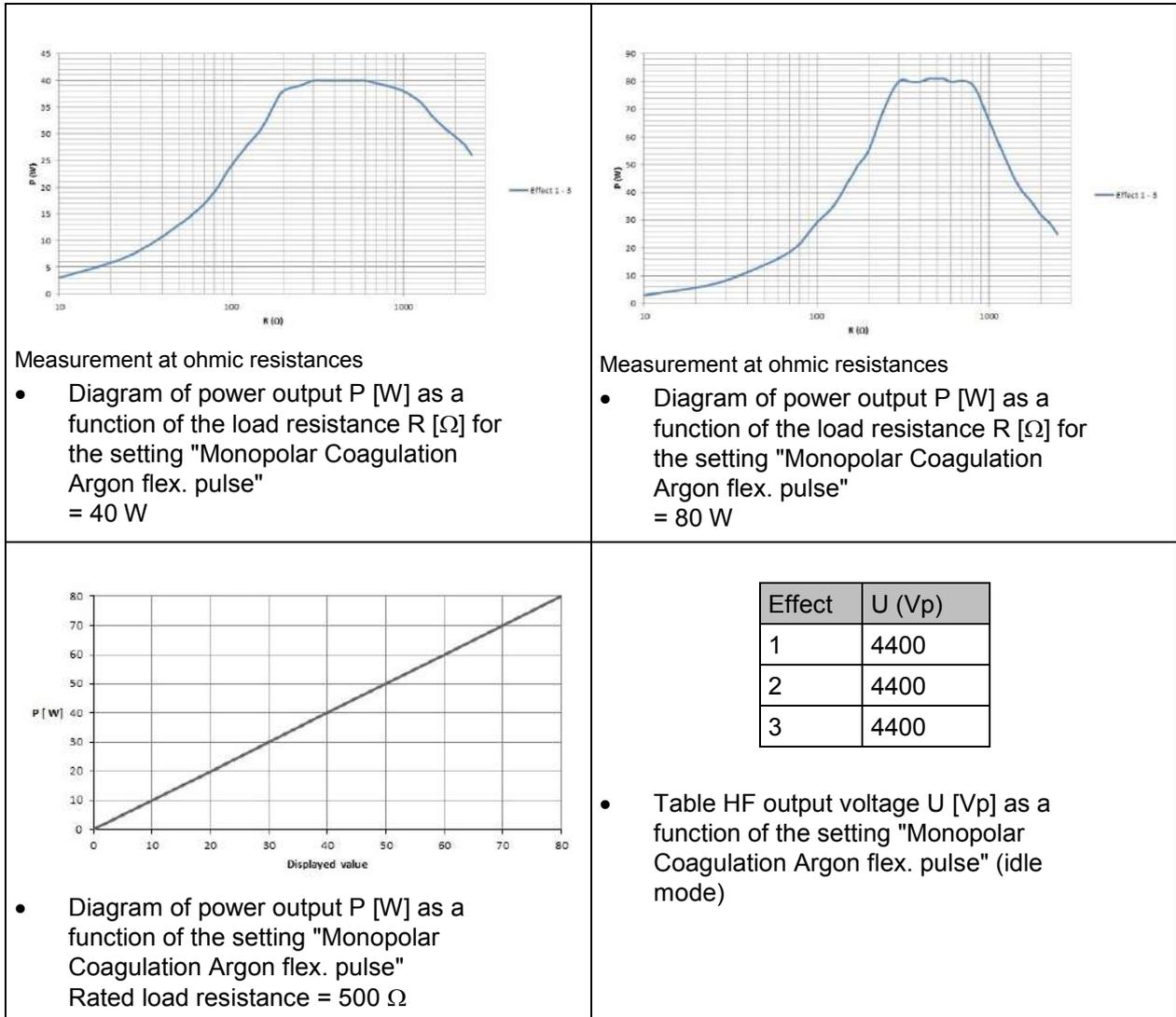
Monopolar Coagulation – Argon open



Monopolar Coagulation – Argon flexible

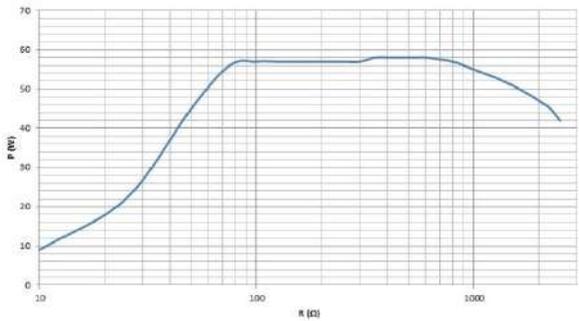
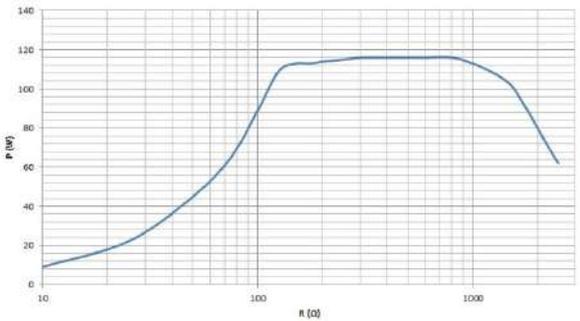
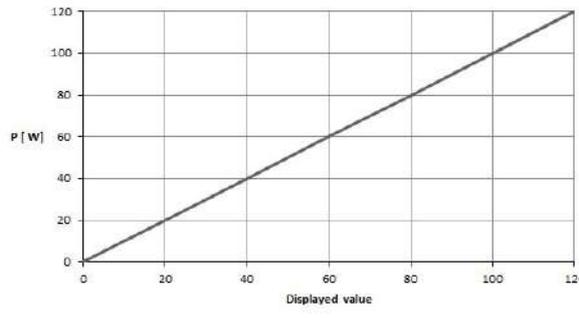
| | |
|--|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Argon flexible" = 60 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Argon flexible" = 120 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Argon flexible" Rated load resistance = 500 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting "Monopolar Coagulation Argon flexible" (idle mode) = 4400 Vp |

Monopolar Coagulation – Argon flex. pulse

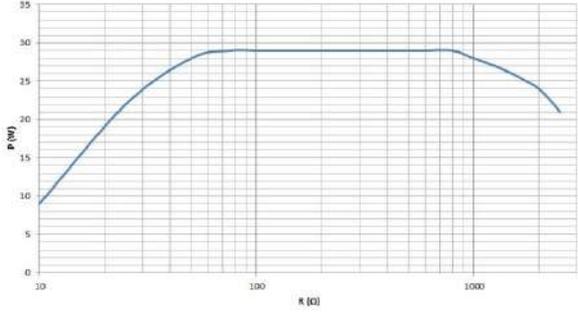
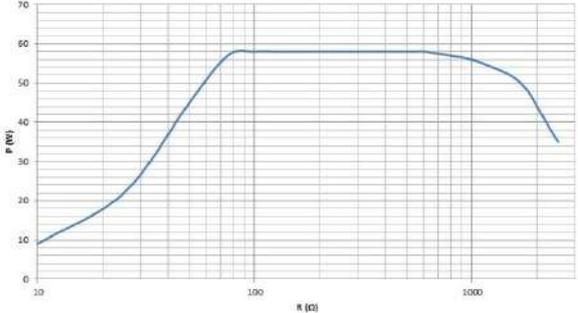
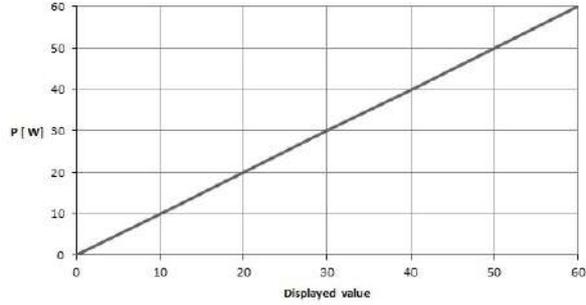


The puls frequency changes with the effect setting. The higher the effect level, the faster the pulse sequence.
 Effect 1: 1 Hz, effect 2: 5 Hz, effect 3: 10 Hz
 The mode "Argon flexible" is paused due to the pulse sequence.

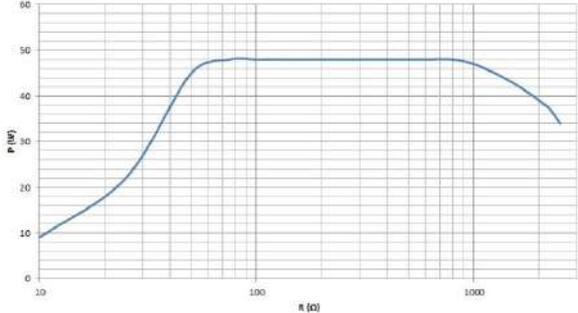
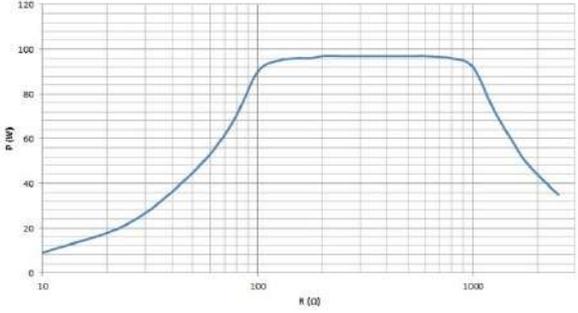
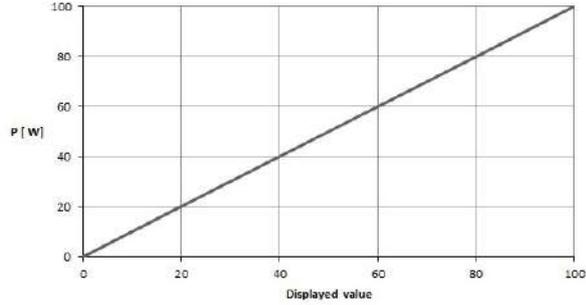
Monopolar Coagulation – Resection

| | |
|---|---|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Resection" = 60 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Resection" = 120 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Resection" Rated load resistance = 500 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting "Monopolar Coagulation Resection" (idle mode) = 2600 Vp |

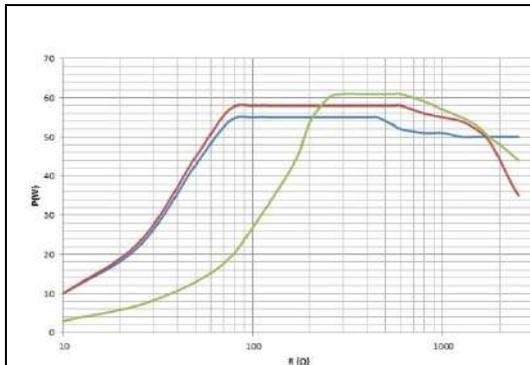
Monopolar Coagulation – Cardiac Mammary

| | |
|---|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Cardiac Mammary" = 30 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Cardiac Mammary" = 60 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Cardiac Mammary" Rated load resistance = 500 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting "Monopolar Coagulation Cardiac Mammary" (idle mode) = 2300 Vp |

Monopolar Coagulation – Cardiac Thorax

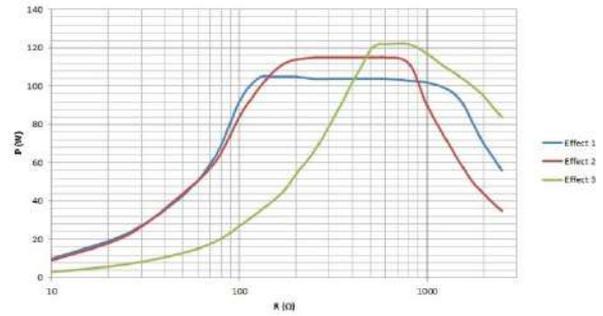
| | |
|--|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Cardiac Thorax" = 50 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Cardiac Thorax" = 100 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting "Monopolar Coagulation Cardiac Thorax" Rated load resistance = 500 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting "Monopolar Coagulation Cardiac Thorax" (idle mode) = 2300 Vp |

Monopolar Coagulation – SimCoag



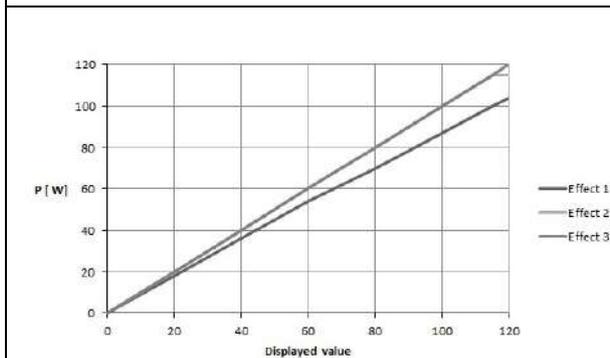
Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation SimCoag" = 60 W



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation SimCoag" = 120 W

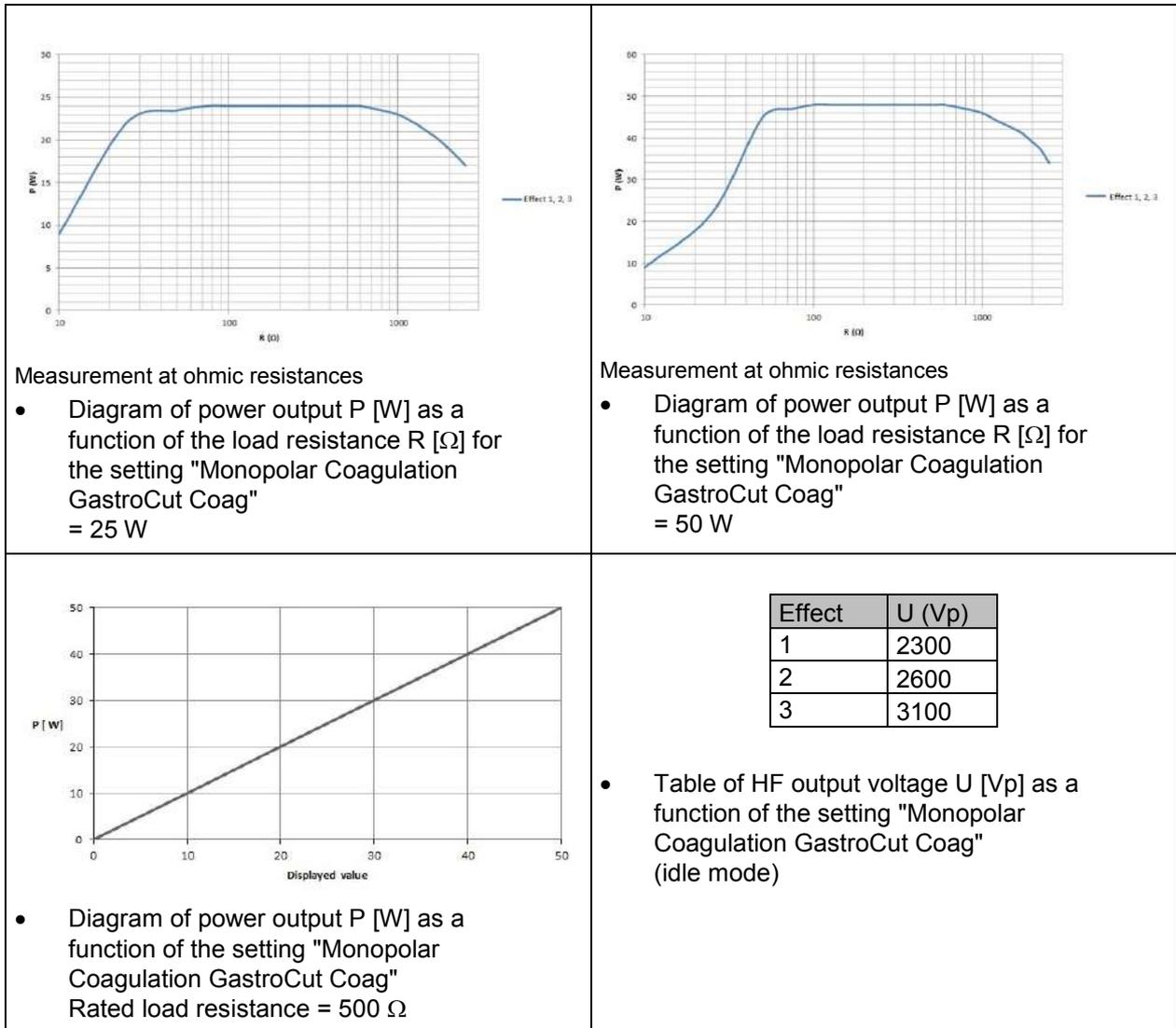


- Diagram of power output P [W] as a function of the setting "Monopolar Coagulation SimCoag" Rated load resistance = 500 Ω

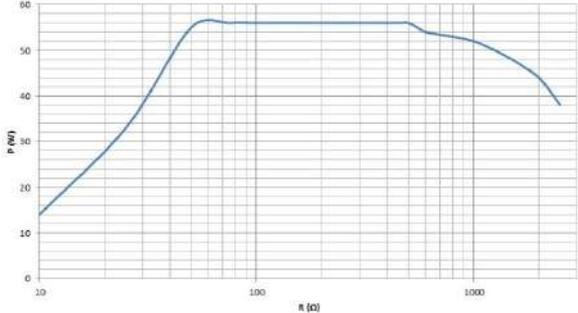
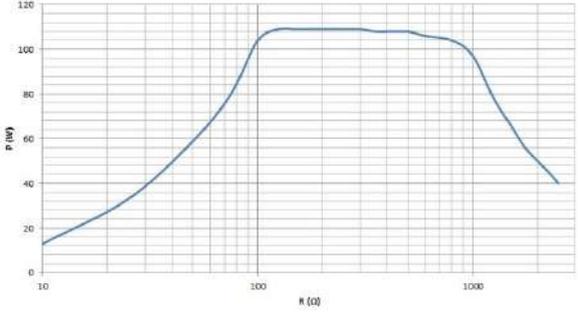
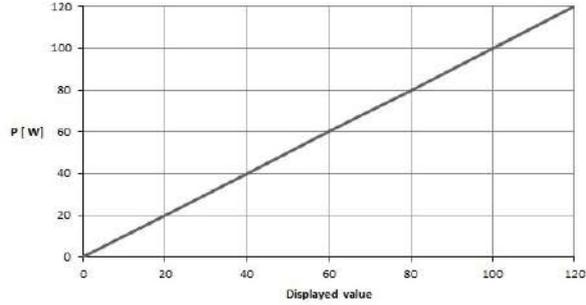
| Effect | U (Vp) |
|--------|--------|
| 1 | 1500 |
| 2 | 2300 |
| 3 | 4600 |

- Table of HF output voltage U [Vp] as a function of the setting "Monopolar Coagulation SimCoag" (idle mode)

Monopolar Coagulation – Gastro Coag



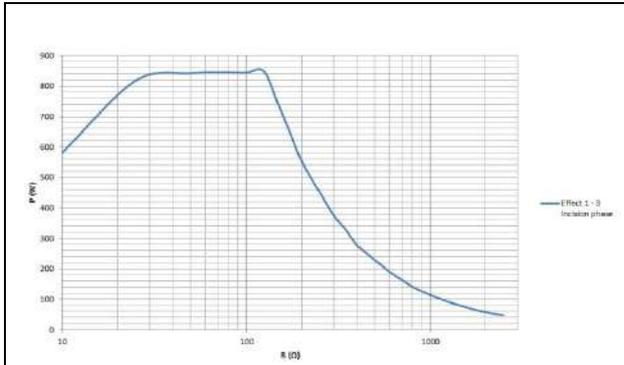
Monopolar Coagulation – Laparoscopy

| | |
|---|--|
|  |  |
| <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Laparoscopy" = 60 W | <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Monopolar Coagulation Laparoscopy" = 120 W |
|  | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting "Monopolar Coagulation Laparoscopy" (idle mode) = 1800 Vp |

Bipolar Cutting – Standard

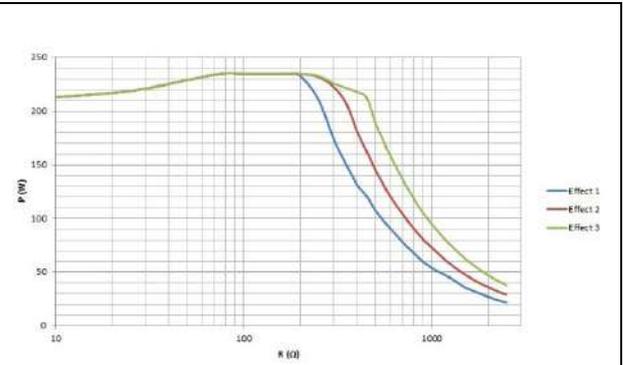
| | |
|---|---|
| | |
| <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Cutting Standard" = 100 W | <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Cutting Standard" = 200 W |
| | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting "Bipolar Cutting Standard" (idle mode) = 400 Vp |

Bipolar Cutting – Resection



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Cutting Resection" cut phase



Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Cutting Resection" phase after the cut

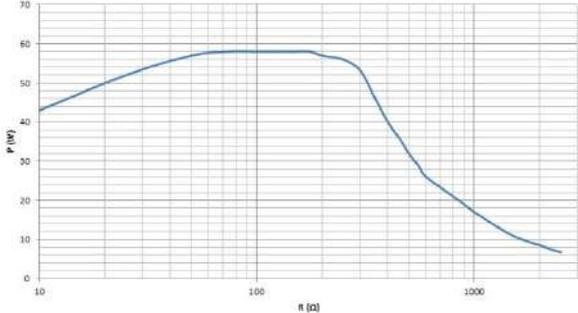
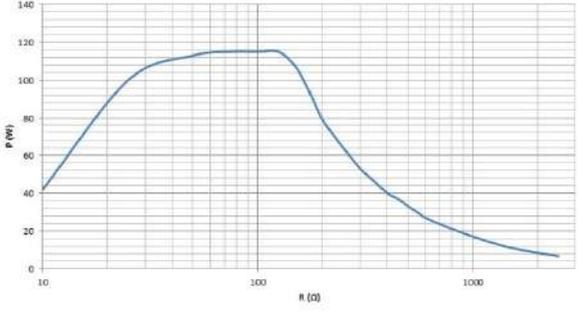
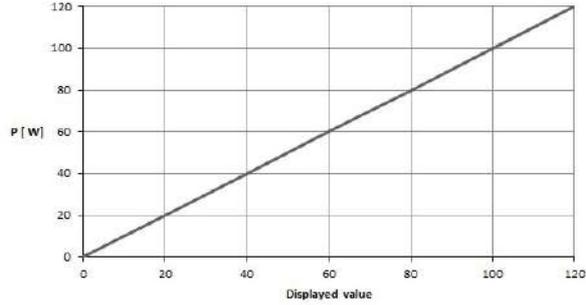
| Effect | P (W) |
|--------|-------|
| 1 | 250 |
| 2 | 250 |
| 3 | 250 |

- Table of power output P [W] as a function of the setting " Bipolar Cutting Resection " Rated load resistance = 75 Ω

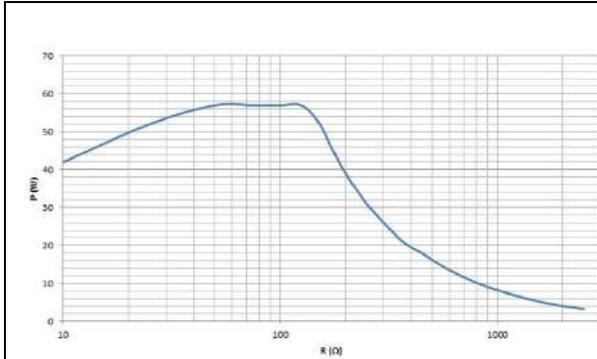
| Effect | U (Vp) |
|--------|--------|
| 1 | 500 |
| 2 | 500 |
| 3 | 500 |

- Table of HF output voltage U [Vp] as a function of the setting " Bipolar Cutting Resection " (idle mode)

Bipolar Cutting – Bipolar scissors

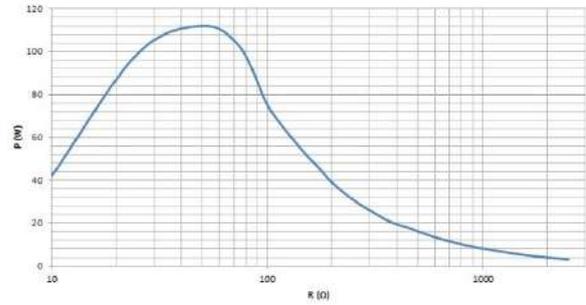
| | |
|--|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Cutting n bipolar scissors" = 60 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Cutting bipolar scissors" = 120 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting " Bipolar Cutting bipolar scissors " Rated load resistance = 75 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " Bipolar Cutting Bipolar scissors " (idle mode) = 200 Vp |

Bipolar Coagulation – Standard forceps



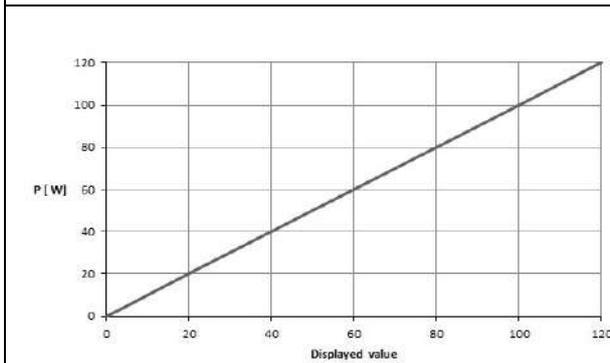
Measurement at ohmic resistances

- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Standard forceps" = 60 W



Measurement at ohmic resistances

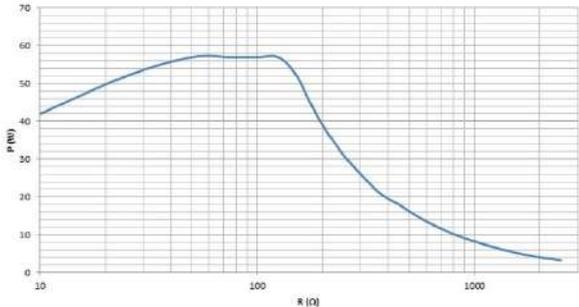
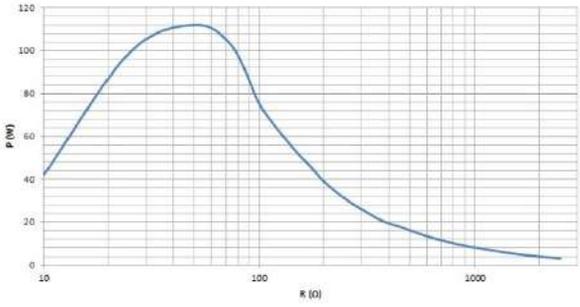
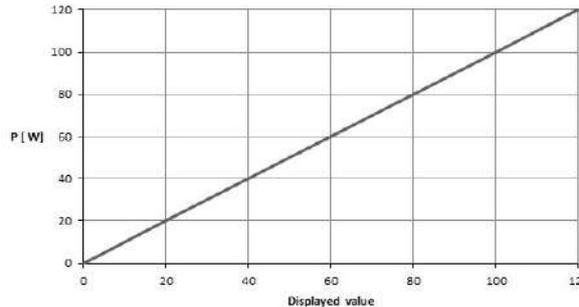
- Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Standard forceps" = 120 W



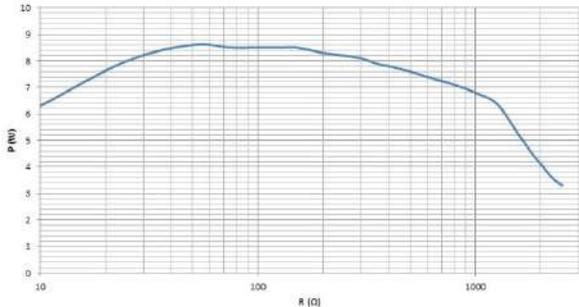
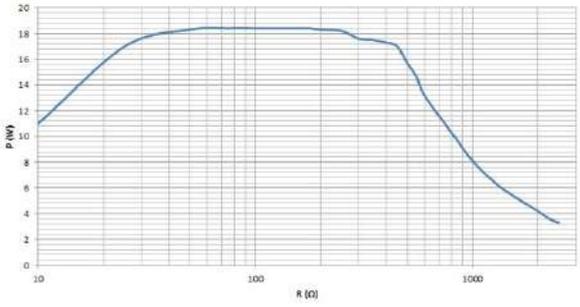
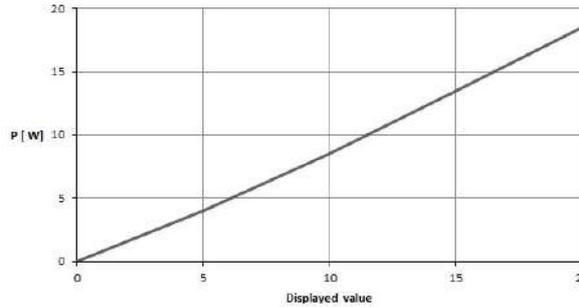
- Diagram of power output P [W] as a function of the setting " Bipolar Coagulation Standard forceps " Rated load resistance = 50 Ω

- HF output voltage U [Vp] for the setting " Bipolar Coagulation Standard forceps " (idle mode) = 150 Vp

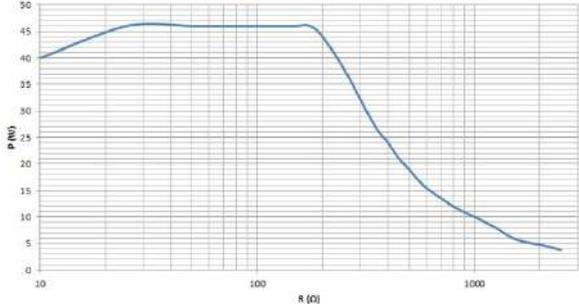
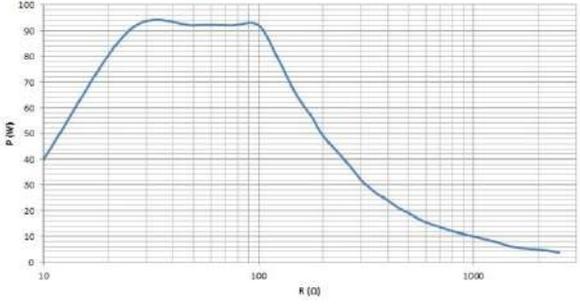
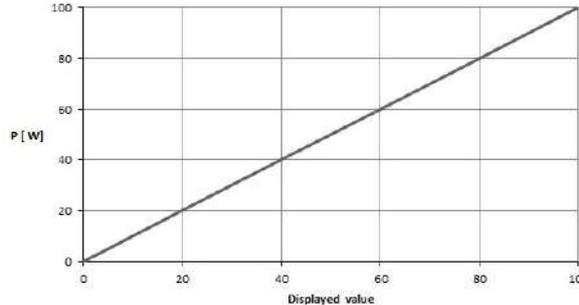
Bipolar Coagulation – Standard forceps AUTOSTART

| | |
|--|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Standard forceps AUTOSTART" = 60 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Standard forceps AUTOSTART" = 120 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting " Bipolar Coagulation Standard forceps AUTOSTART" Rated load resistance = 50 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " Bipolar Coagulation Standard forceps AUTOSTART" (idle mode) = 150 Vp |

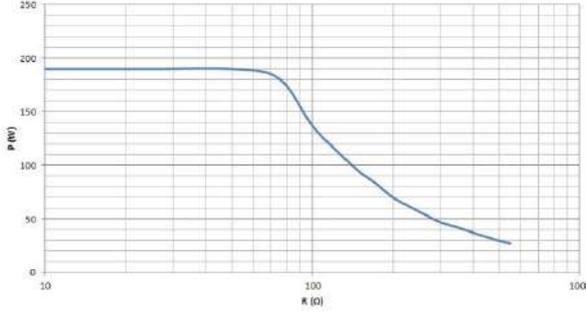
Bipolar Coagulation – Micro forceps

| | |
|---|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Micro forceps" = 10 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Micro forceps" = 20 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting " Bipolar Coagulation Micro forceps " Rated load resistance = 50 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " Bipolar Coagulation Micro forceps " (idle mode) = 150 Vp |

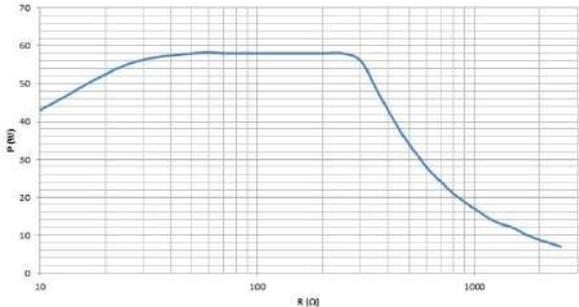
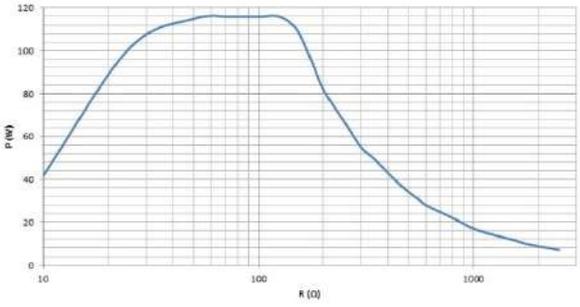
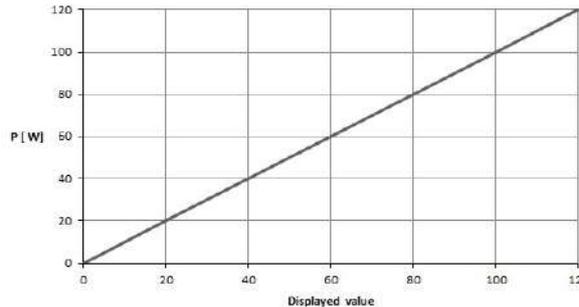
Bipolar Coagulation – Forceps forced

| | |
|--|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation forceps forced" = 50 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation forceps forced" = 100 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting " Bipolar Coagulation forceps forced " Rated load resistance = 50 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " Bipolar Coagulation forceps forced " (idle mode) = 550 Vp |

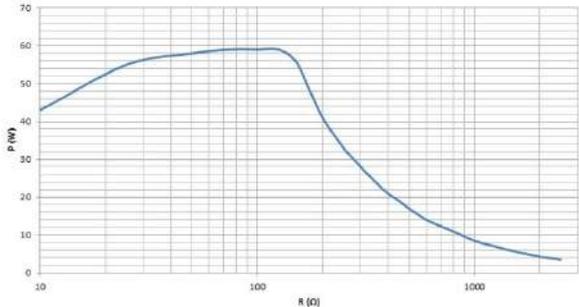
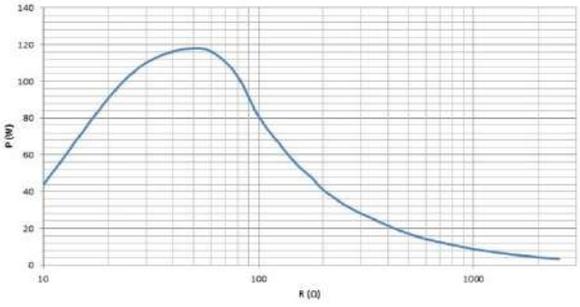
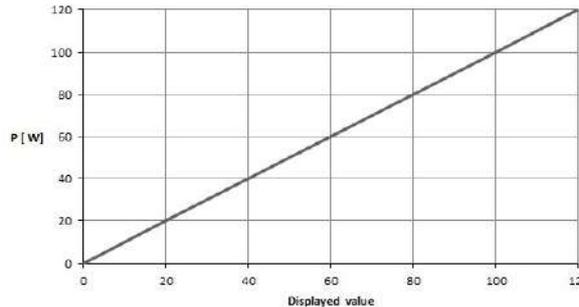
LIGATION / TissueSeal PLUS

| | |
|---|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "LIGATION" | |
| <ul style="list-style-type: none"> • Power output P [W] as a function of the setting " LIGATION " Rated load resistance (25 Ω) = 200 W | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " LIGATION " (idle mode) = 190 Vp |

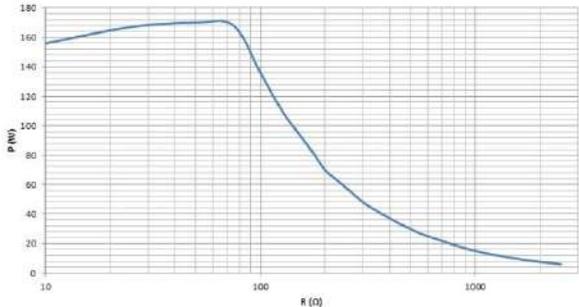
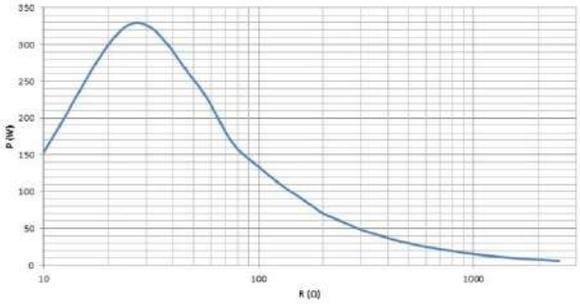
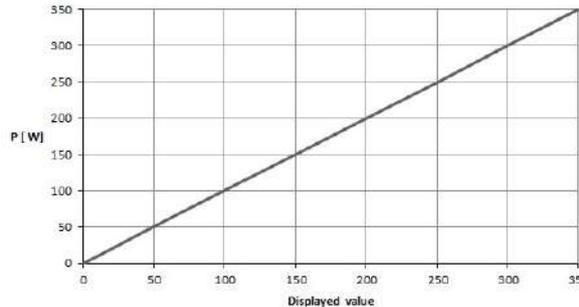
Bipolar Coagulation – Bipolar scissors

| | |
|--|--|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation bipolar scissors" = 60 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation bipolar scissors" = 120 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting " Bipolar Coagulation bipolar scissors" Rated load resistance = 75 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " Bipolar Coagulation Bipolar scissors " (idle mode) = 200 Vp |

Bipolar Coagulation– Laparoscopy

| | |
|---|---|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Laparoscopy" = 60 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Laparoscopy" = 120 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting " Bipolar Coagulation Laparoscopy " Rated load resistance = 50 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " Bipolar Coagulation Laparoscopy " (idle mode) = 150 Vp |

Bipolar Coagulation – Bipolar Resection

| | |
|--|---|
|  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Bipolar Resection" = 175 W |  <p>Measurement at ohmic resistances</p> <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the load resistance R [Ω] for the setting "Bipolar Coagulation Bipolar Resection" = 350 W |
|  <ul style="list-style-type: none"> • Diagram of power output P [W] as a function of the setting " Bipolar Coagulation Bipolar Resection " Rated load resistance = 25 Ω | <ul style="list-style-type: none"> • HF output voltage U [Vp] for the setting " Bipolar Coagulation Bipolar Resection " (idle mode) = 190 Vp |

11. Accessories and replacement parts

Original BOWA accessories are suitable for use with the ARC Series and ARC PLUS devices. When using accessories made by other manufacturers, the user must ensure that they are designed for and compatible with the maximum HF peak voltage of the HF device.

For the use and correct preparation of the autoclavable devices, compliance with the relevant instruction manuals accompanying these devices is required.

Detailed information on accessories and replacement parts is available in the current accessories catalog.

12. EMC

12.1. Guidelines and manufacturer's declaration in accordance with IEC 60601-1-2 Section 6.8.3.201

| Emission of electromagnetic interference (IEC 60601-1-2, Table 201) | | |
|---|-----------------|---|
| The ARC 350 is intended for operation in an electromagnetic environment as described below. The customer or user of the ARC 350 should ensure that it is operated in such an environment. | | |
| Interference emission measurement | Conformity | Electromagnetic environment guideline |
| HF emissions according to CISPR 11 | Group 2 | The ARC 350 must emit electromagnetic energy in order to perform its intended function. Nearby electronic devices may be affected. |
| HF emissions according to CISPR 11 | Class A | The ARC 350 is suitable for use in facilities other than those suitable for a residential environment or those connected directly to the public power grid, which also supplies power to buildings used for residential purposes. |
| Emission of harmonics according to IEC 61000-3-2 | Classes A and D | |
| Emission of voltage fluctuations and flickere according to IEC 61000-3-3 | Conforms | |

| Immunity to electromagnetic interference (IEC 60601-1-2, Table 202) | | | |
|---|--|--|---|
| The ARC 350 is intended for operation in an electromagnetic environment as described below. The customer or user of the ARC 350 should ensure that it is operated in such an environment. | | | |
| Interference immunity test | IEC 60601 test level | Conformity level | Electromagnetic environment guidelines |
| Electrostatic discharge (ESD) according to IEC 61000-4-2 | ±6 kV contact discharge | ±6 kV contact discharge | Floors should be wooden or concrete or finished with ceramic tiles. If the floor is finished with a synthetic material, the relative humidity must be at least 30%. |
| | ±8 kV air discharge | ±8 kV air discharge | |
| Fast transient electrical noise or bursts according to IEC 61000-4-4 | ±2 kV on AC supply lines | ±2 kV on AC supply lines | The quality of the AC power should correspond to that of a typical business or hospital environment. |
| | ±1 kV on input and output lines | ±1 kV on input and output lines | |
| Surges according to IEC 61000-4-5 | ±1 kV between external conductors | ±1 kV between external conductors | The quality of the AC power should correspond to that of a typical business or hospital environment. |
| | ±2 kV between external conductor and ground | ±2 kV between external conductor and ground | |
| Voltage dropouts, brief interruptions and supply voltage fluctuations according to IEC 61000-4-11 | < 5% U_T for one half-cycle (> 95% dropout) 40% U_T for 5 cycles (60% dropout) 70% U_T for 25 cycles (30% dropout) < 5% U_T for 5 s (> 95% dropout) | < 5% U_T for one half-cycle (> 95% dropout) 40% U_T for 5 cycles (60% dropout) 70% U_T for 25 cycles (30% dropout) < 5% U_T for 5 s (> 95% dropout) | The quality of the AC power should correspond to that of a typical business or hospital environment. If the ARC 400 user requires it to continue operating in the event of a power dropout, it is recommended to power the ARC 400 from an uninterruptible power supply or a battery. |
| Note: U_T is the AC supply voltage before the test level is applied. | | | |

| Immunity to electromagnetic interference (IEC 60601-1-2, Table 204) | | | |
|---|--|-------------------------|---|
| The ARC 350 is intended for operation in an electromagnetic environment as described below. The customer or user of the ARC 350 should ensure that it is operated in such an environment. | | | |
| Interference immunity test | IEC 60601 test level | Conformity level | Electromagnetic environment guidelines |
| Conducted HF interference according to IEC 61000-4-6 | 3 Vrms 150 kHz to 80 MHz | 10 V | <p>Portable and mobile wireless devices should not be used inside the recommended protective distance from the ARC 400 and its cables, as calculated using the equation for the relevant transmission frequency.</p> <p>Recommended protective distance:</p> $d = 0.35 \times \sqrt{P}$ $d = 0.35 \times \sqrt{P} \text{ for } 80 \text{ MHz to } 800 \text{ GHz}$ $d = 0.75 \times \sqrt{P} \text{ for } 80 \text{ MHz to } 2.5 \text{ GHz}$ <p>where P is the rated transmitter output power in watts (W) as specified by the transmitter manufacturer and d is the recommended protective distance in meters (m).</p> <p>The field strength of stationary transmitters as determined by on-site measurements^a should be lower than the compliance level^b at all frequencies.</p> <p>Interference is possible in the vicinity of devices that bear the following symbol:</p>  |
| Radiated HF interference according to IEC 61000-4-3 | 3 V/m 80 MHz to 2.5 GHz | 10 V/m | |
| Note 1 | The higher frequency range applies in case of 80 MHz and 800 MHz. | | |
| Note 2 | These guidelines may not be applicable in all cases. The propagation of electromagnetic waves is influenced by absorption and reflection by buildings, objects and people. | | |
| ^a | Field strengths from stationary transmitters, such as base stations for radio telephones, land mobile radios, amateur radio, AM and FM radio broadcasting and TV broadcasting, cannot be predicted accurately based on theoretical considerations. A survey of the electromagnetic conditions at the site should be performed to determine the electromagnetic environment resulting from stationary transmitters. If the measured field strength at the location where the ARC 400 is used exceeds the stated compliance level, the ARC 400 should be monitored to verify that it operates correctly. Additional measures, such as altering the orientation or location of the ARC 400, may be necessary if abnormal operation is observed. | | |
| ^b | The field strength should be lower than 10 V/m over the frequency range of 150 kHz to 80 MHz. | | |

Recommended protective distances between portable and mobile HF telecommunication devices and the ARC 400 (IEC 60601-1-2, Table 206)

The ARC 350 is designed for operation in an electromagnetic environment in which HF interference is monitored. The customer or user of the ARC 350 can help to prevent electromagnetic interference by complying with the minimum distance between portable and mobile HF telecommunication devices (transmitters) and the ARC 400. This distance depends on the output power of the communication device, as specified below.

| Rated transmitter power (W) | Protective distance (m) at various transmission frequencies | | |
|---|--|---|---|
| | 150 kHz to 80 MHz $d = 0.35 \times \sqrt{P}$ | 80 MHz to 800 GHz $d = 0.35 \times \sqrt{P}$ | 800 MHz to 2.5 GHz $d = 0.7 \times \sqrt{P}$ |
| 0.01 | 0.035 | 0.035 | 0.07 |
| 0.1 | 0.11 | 0.11 | 0.22 |
| 1 | 0.35 | 0.35 | 0.70 |
| 10 | 1.1 | 1.1 | 2.2 |
| 100 | 3.5 | 3.5 | 7.0 |
| For transmitters whose maximum rated power is not specified in the table above, the recommended protective distance d in meters (m) can be determined using the equation in the corresponding column, where P is the maximum rated output power of the transmitter in watts (W) as specified by the transmitter manufacturer. | | | |
| Note 1 | The higher frequency range applies in case of 80 MHz and 800 MHz. | | |
| Note 2 | These guidelines may not be applicable in all cases. The propagation of electromagnetic waves is influenced by absorption and reflection by buildings, objects and people. | | |

13. Disposal



Always comply with the national regulations of the relevant country when disposing of or recycling the device or its components.

| Symbol | Designation |
|---|--|
|  | A device marked with this symbol must be put into the separate waste collection for electrical and electronic devices. Disposal is carried out free of charge by the manufacturer within the European Union. |

- ▶ If you have any questions regarding product disposal, contact the service center, see section Technical service, page 73

BOWA
EINFACH SICHER

BOWA-electronic GmbH & Co. KG
Heinrich-Hertz Strasse 4–10
D-72810 Gomaringen | Germany

Phone: +49 (0) 7072-6002-0
Fax: +49 (0) 7072-6002-33
info@bowa-medical.com | www.bowa-medical.com



CE marked according to
Medical Device 93/42/EWG

1. Electrosurgical unit ARC 350



Electrosurgical unit ARC 350

Touch-assisted universal system for almost all areas of electrosurgery

- > Connection of two monopolar and two bipolar instruments
- > Interactive fingertip operation for optimal ease of use
- > Numerous standard interventions are already pre-programmed
- > Easy adjustment of effects or power values

Scope of delivery

Incl. instructions for use, mains cable, equipotential bonding cable

Product number: 900-351

Unit: 1 piece

[Inquiry](#)

Description **Specification** Download

| | |
|----------------------------------|--|
| Size / Dimensions | 430 x 180 x 475 mm |
| Total gross weight | 18 KG |
| Net unit weight | 12.5 KG |
| Sterile / non-sterile | Non-sterile |
| Preparation | Wipe disinfection |
| Permissible combinations | Accessories with the following connectors depending on the receptacle configuration: 3-pin International, 2-pin 28 mm International, 8 mm Bovie Jack, 9/5 mm Erbe ACC / ICC / VIO, 8/4 mm Erbe, 3-pin BOWA COMFORT, 900-001, 900-395, 900-396, 900-401, 900-402, 901-011, 901-031, 901-032 |
| Packaging unit | PCS (1 PCS) |
| Scope of delivery | Incl. instructions for use, mains cable, equipotential bonding cable |
| CE conformity marking | YES |
| Notified body | TÜV SÜD Product Service GmbH (0123) |
| EU medical device classification | IIb |
| Manufacturer | BOWA-electronic GmbH & Co. KG |
| Note | Options incl. Plug'n Cut COMFORT instrument recognition |

2. Rubber return plate, adults, 250 x 150 mm, international



Rubber return plate, adults, 250 x 150 mm, international

Reusable neutral electrodes for simple procedures

Product number: 242-003
Unit: 1 piece

Use: Adults

Connection: International

[Reset selection](#)

[Inquiry](#)

| Description | Specification | Download |
|----------------------------------|-------------------------------|----------|
| Size / Dimensions | 375 cm ² | |
| Cable | 0.5 m | |
| Total gross weight | 454 G | |
| Net unit weight | 279 G | |
| Monopolar / bipolar / passive | Passive | |
| Single-use / reusable | Reusable | |
| Sterile / non-sterile | Non-sterile | |
| Cleaning / Disinfecting | Autoclave | |
| Preparation | 75 cycles | |
| Permissible combinations | 194-075, 295-050, 385-050 | |
| Packaging unit | PCS (1 PCS) | |
| CE conformity marking | YES | |
| EU medical device classification | IIb | |
| Manufacturer | BOWA electronic GmbH & Co. KG | |
| Note | non-split, for adults > 15 kg | |

3. Cable, rubber return plate, international, 4.5 m



Cable, rubber return plate, international, 4.5 m

Cable for reusable neutral electrodes

- > High voltage reliability
- > Autoclavable

Scope of delivery
Incl. instructions for use
Product number: 385-050
Unit: 1 piece

Device connection: 2 pin international NON-REM

[Reset selection](#)

[Inquiry](#)

| Description | Specification | Download |
|----------------------------------|-------------------------------|----------|
| Length | 4.5 m | |
| Total gross weight | 162 G | |
| Net unit weight | 100 G | |
| Electric strength | 500 Vp | |
| Monopolar / bipolar / passive | passive | |
| Single-use / reusable | Reusable | |
| Sterile / non-sterile | Non-sterile | |
| Cleaning / Disinfecting | Autoclave | |
| Preparation | 200 cycles | |
| Connector type | BOWA / Valleylab NON-REM | |
| Permissible combinations | 232-003, 242-003 | |
| Packaging unit | PCS (1 PCS) | |
| Scope of delivery | Incl. instructions for use | |
| CE conformity marking | YES | |
| EU medical device classification | I | |
| Manufacturer | BOWA-electronic GmbH & Co. KG | |

4. Double-pedal footswitch

BOWA
M E D I C A L

901-031



ARC Electrosurgery▼

Instruments / Accessories▼

LOTUS Ultrasound Surgery▼

Plasma surgery▼

Flue gas▼

Morcellation▼



Dual pedal foot switch, with push button, 4 m cable

ARC foot switch series for ARC, ARC 400, ARC 350, ARC 303, ARC 250

Scope of delivery

Includes instructions for use.

Article number: 901-031

Unit of sale: 1 piece

Type: Dual pedal with push button

Reset selection

Inquiry

Description

Technical data

Download

ARC foot switch with push button

The BOWA foot switch series offers a selection of different models depending on the ARC device system used. Depending on the chosen foot switch type, features include a cut-and-coag pedal, a removable handle, and a 4-meter cable for a generous operating range. Models with additional toggle switches allow for switching the device function from within the operating room. Effective cleaning and safety are ensured by full immersion and explosion protection.

5. Equipotential bonding, 0.5 m/ Equipotential bonding, 5 m



Equipotential bonding, 5 m

Equipotential bonding cables for BOWA devices and equipment trolleys

Product number: 900-031

Length: 5 m

[Reset selection](#)

[Inquiry](#)

| Description | Specification |
|----------------------------------|--|
| Size / Dimensions | 5 m |
| Total gross weight | 334 G |
| Net unit weight | 329 G |
| Sterile / non-sterile | Non-sterile |
| Preparation | Wipe disinfection |
| Permissible combinations | LG4, 900-000, 900-001, 900-100, 900-250, 900-303, 900-351, 900-400, 900-600, 902-050, 902-054, 902-055, 902-056, 902-070, 902-911, 950-001 |
| Packaging unit | PCS (1 PCS) |
| CE conformity marking | NO |
| EU medical device classification | non-medical |

6. JackKNIFE, 2 switches, shaft 4 mm, for 3-pin, cable 4.5 m



JackKNIFE, 2 switches, shaft 4 mm, for 3-pin, cable 4.5 m

Universal ergonomics in a modern design

Scope of delivery
Incl. Instructions for use
Product number: 220-145
Unit: 1 piece

Electrode receiver: 4 mm

Socket type: 3-pin International

[Reset selection](#)

Inquiry

[Description](#) [Specification](#) [Download](#)

Handle for JackKNIFE

The reusable JackKNIFE handles are characterised by a very slim design, long service life and an ergonomic shape. Electrosurgical cutting and coagulation are possible using two buttons with different electrodes. The handles are reprocessed using cost-effective steam sterilisation. The electrode holder optionally allows the use of 2.4 or 4 mm electrodes depending on the design. With a cable length of 4.5 m, the handle provides a generous action radius.

7. Electrode Knife



Electrodes, short

Reusable short electrodes for electrosurgery

- > With heat-resistant safety insulation
- > Dielectric strength up to 5700 Vp
- > Reusable

Type: Knife electrode

Shape: Straight, rhombic

Shaft diameter choose

[Reset selection](#)

Inquiry

[Description](#)

Short electrodes for electrosurgical cutting and coagulation

The short, monopolar electrodes are used for electrosurgical cutting and coagulation. In monopolar RF surgery, tissue coagulation is achieved by applying a high-frequency AC current, which generates heat. The RF current flows from the active electrode to the large-area neutral electrode. A high current density develops on the surface of the active electrode, which creates the desired thermal effect for cutting or coagulating the tissue. The safety insulation of the short electrodes guarantees a dielectric strength of up to 5700 Vp.

8. Electrode Ball



Ball electrode, straight, Ø 4 mm, shaft 4 mm
Reusable short electrodes for electrosurgery

- > With heat-resistant safety insulation
- > Dielectric strength up to 5700 Vp
- > Reusable

Scope of delivery
Incl. instructions for use
Product number: 500-021
Unit: 1 pack (5 pcs.)

Type: Ball electrode, Ø 4 mm

Shape: Straight

Shaft diameter: 4 mm

[Reset selection](#)

Inquiry

[Description](#) [Specification](#) [Download](#)

Short electrodes for electrosurgical cutting and coagulation

The short, monopolar electrodes are used for electrosurgical cutting and coagulation. In monopolar RF surgery, tissue coagulation is achieved by applying a high-frequency AC current, which generates heat. The RF current flows from the active electrode to the large-area neutral electrode. A high current density develops on the surface of the active electrode, which creates the desired thermal effect for cutting or coagulating the tissue. The safety insulation of the short electrodes guarantees a dielectric strength of up to 5700 Vp.

Electrod ac



Needle electrode, straight, shaft 4 mm

Reusable short electrodes for electrosurgery

- > With heat-resistant safety insulation
- > Dielectric strength up to 5700 Vp
- > Reusable

Scope of delivery
Incl. instructions for use
Product number: 500-011
Unit: 1 pack (5 pcs.)

Type: Needle electrode

Shape: Straight

Shaft diameter: 4 mm

[Reset selection](#)

Inquiry

Description Specification Download

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BOWA
ACADEMY

ГИНЕКОЛОГИЯ



ИСПОЛЬЗОВАНИЕ ЭЛЕКТРОХИРУРГИЧЕСКИХ СИСТЕМ BOWA В ГИНЕКОЛОГИИ
ОСНОВНЫЕ ПРИНЦИПЫ СОВРЕМЕННОЙ ВЫСОКОЧАСТОТНОЙ ХИРУРГИИ | РЕЗЕКЦИЯ ПРИДАТКОВ |
ГИСТЕРЭКТОМИЯ | ЭНДОМЕТРИОЗ | МАСТЭКТОМИЯ | СПИСОК ЛИТЕРАТУРЫ



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С учетом конкретных обстоятельств может потребоваться изменить приведенные здесь настройки.

Благодаря непрекращающимся исследованиям и наработкам в области клинического применения медицинские технологии постоянно развиваются. Именно по этим причинам пересмотр приведенной в брошюре информации может быть весьма полезным.

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работка, распространение и прочее использование разрешены только с предварительного письменного согласия BOWA-electronic GmbH & Co. KG.



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1

ОСНОВНЫЕ ПРИНЦИПЫ СОВРЕМЕННОЙ ВЫСОКО- ЧАСТОТНОЙ ХИРУРГИИ

1.1 | КРАТКИЙ КУРС ИСТОРИИ РАЗВИТИЯ ЭЛЕКТРОХИРУРГИИ⁽¹⁾

Первые упоминания о лечении при помощи тепловой обработки ткани содержатся в древнеегипетских папирусах, во времена Древней Греции и Рима оно проводилось при помощи раскаленного железа, затем появились режущие петли для хирургического вмешательства, а в 19 веке была разработана техника гальванокаутеризации.

Однако высокочастотная хирургия (ВЧ хирургия) в современном понимании начала развиваться только в 20 веке. В основе метода ВЧ хирургии лежит преобразование в тканях электрической энергии в тепловую, в то время как основой ранее применявшихся техник является принцип передачи температуры в ткани через нагретые инструменты.

Первые многоцелевые инструменты, основанные на термокатодных лампах, были разработаны в 1955 г., за ними в 70-х появились устройства на базе транзистора, в 1976 г. - аргоноплазменные коагуляторы, ВЧ хирургические инструменты, контролируемые с помощью микропроцессора, стали доступны с начала 90-х годов. Такие высокоточные инструменты впервые позволили изменять настройки различных параметров для направленного применения электрического тока.

1.2 | ОСНОВЫ СОВРЕМЕННОЙ ВЫСОКОЧАСТОТНОЙ ХИРУРГИИ⁽¹⁾

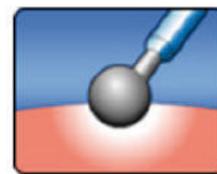
В зависимости от характеристик, показателей и частоты действие электрического тока на ткани может быть описано как «электролитическое» (деструктивное), «фарадическое» (стимулирующее нервы и мышцы) или термическое. ВЧ хирургия основана на действии переменного тока с частотой не меньше 200 кГц с преобладающим термическим воздействием. Тепловой эффект в основном зависит от времени, в течение которого ткани подвергаются воздействию тока, плотности тока и специфического сопротивления ткани, которое, в основном, уменьшается при увеличении содержания жидкости или кровоснабжения. На практике необходимо учитывать, что часть переменного тока проходит мимо непосредственной области воздействия и может повредить другие области (например, во время промывания риск будет выше при использовании монополярной техники, чем биполярной).



ВЧ-аппарат BOWA ARC 400

1.3 | ЭЛЕКТРОКОАГУЛЯЦИЯ⁽¹⁾

Коагулирующее действие достигается при очень медленном нагревании ткани до более чем 60 °С. Процесс коагуляции приводит к многочисленным изменениям ткани, включая денатурацию белков, выпаривание внутриклеточной и внеклеточной жидкости, а также сморщивание ткани.



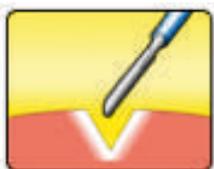
Значок режима «умеренная коагуляция»

В ВЧ хирургии используются различные типы коагуляции. Техники отличаются характеристиками электрического тока и способом применения и включают контактную коагуляцию, усиленную коагуляцию, высушивание (коагуляцию при введении игольчатого электрода), спрей-коагуляцию (фульгурацию), аргоноплазменную коагуляцию (АПК), биполярную коагуляцию и биполярное заваривание сосудов.

1.4 | ЭЛЕКТРОТОМИЯ⁽¹⁾

Эффект разрезания достигается путем очень быстрого повышения температуры

ткани до более чем 90-100 °С, что вызывает накопление в клетках пара, который разрывает клеточную стенку, а затем работает как изолятор. Между электродом и тканью образуется вольтова дуга, неизбежно вызывающая непрерывное искрение при напряжениях выше 200 В с очень высокой плотностью тока в точках контакта. Дуга образуется независимо от окружающей среды (например, воздух или жидкость).



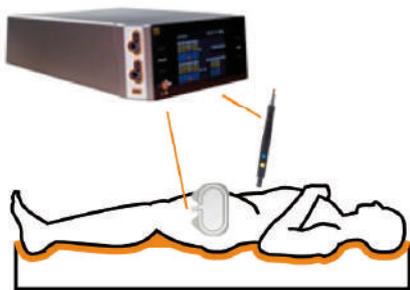
Значок режима «разрез стандарт»

ВЧ хирургия делает возможной дополнительную коагуляцию краев раны путем модулирования тока (подъемы напряжения с паузами). В зависимости от интенсивности, разрез может быть ровным или с коагуляцией по краям. Генераторы BOWA ARC имеют 10 уровней тонкой настройки степени коагуляции по краям, в зависимости от потребностей.

Другие термические эффекты тока, менее уместные для ВЧ хирургии, включают карбонизацию (обугливание начинается с примерно 200 °С) и выпаривание (при температуре в несколько сотен градусов Цельсия).

1.5 | МОНОПОЛЯРНЫЙ МЕТОД⁽¹⁾

Монополярная ВЧ хирургия использует замкнутую электрическую цепь, в которой ток идет от активного электрода инструмента через тело пациента к пассивному



Монополярный метод

электроду с большой площадью контакта, а затем назад к генератору.

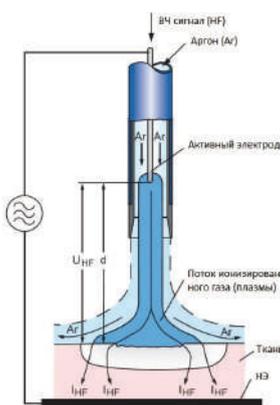
Площадь контакта между концом монополярного инструмента и тканью невелика. Наибольшая плотность тока в цепи достигается в этой точке, тем самым вызывая желаемый термический эффект.

Большая площадь контакта и особая конструкция нейтрального электрода, играющего роль другого полюса, сводит к минимуму местный нагрев.

1.6 | АРГНОПЛАЗМЕННАЯ КООГУЛЯЦИЯ (АПК)⁽¹⁾

АПК - это монополярный метод, при котором ВЧ ток течет через ионизированный газ аргон в ткань так, что между активным электродом и тканью не возникает прямого контакта (бесконтактный метод), и ткань не прилипает к электроду.

Аргон – химически инертный нетоксичный благородный газ, естественно присутствующий в воздухе. К месту хирургического воздействия газ подается через зонд с керамическим наконечником, протекая в нем через монополярный ВЧ электрод, на который подается высокое напряжение. После достижения необходимой напряженности поля, начинается процесс ионизации до плазмы и образуется синее пламя («аргоноплазменный луч»).



Метод аргоноплазменной коагуляции

Электропроводящая плазма автоматически направляется в луче на точку наименьшего электрического сопротивления и коагулирует ткань в этом месте при температурах от 50-60 °С. Аргон сдувает кислород, тем самым предотвращая обуг-



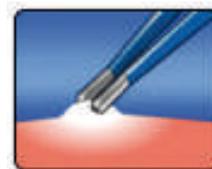
Значок режима «аргон открытый»

ливание, которое иначе могло бы стать причиной плохой видимости для хирурга из-за образования дыма и привести к плохому заживлению раны и послеоперационному кровотечению.

Эти действия дают возможность выполнять операции безопасно, с низкой частотой осложнений, содействуя эффективной коагуляции и разрушению тканевых аномалий, обеспечивая однородную коагуляцию поверхности при ограниченной глубине проникновения.

1.7 | БИПОЛЯРНЫЙ МЕТОД⁽¹⁾

В биполярной ВЧ хирургии ток протекает только через определенный участок ткани между двумя активными электродами, встроенными в инструмент, и не проходит через тело пациента. Таким образом, отпадает необходимость в нейтральном электроде.



Значок режима «пинцет стандарт» биполярного метода

1.8 | ЭЛЕКТРОЛИГИРОВАНИЕ ТКАНИ

Традиционная электрокоагуляция не подходит для кровеносных сосудов диаметром более 2 мм. Для уверенного гемостаза и надежного закрытия сосуда необходимо биполярное заваривание или лигирование. С помощью специального инструмента сосуды и пряди ткани захватываются и сдавливаются до определенного постоянного давления. В зависимости от типа ткани, для спаивания противоположных стенок сосуда применяют ряд автоматиче-

ски управляемых циклов подачи электрического тока с управляемыми электрическими параметрами.

В большинстве случаев, зрительный контроль сосудов до начала процедуры не требуется. Содержащие сосуды пряди ткани могут быть захвачены и заварены. О достижении желаемого эффекта свидетельствует просвечивающая белая зона коагуляции, в пределах которой ткань можно безопасно пересечь. В отдельных случаях может быть рекомендовано заварить сосуд в двух местах на некотором расстоянии и сделать разрез между этими зонами. Биполярное лигирование технически возможно для сосудов диаметром примерно до 10 мм. Эффективность процедуры в клинической практике подтверждена для сосудов диаметром до 7 мм.



Значок режима «лигирование»

Поскольку наконечник инструмента нагревается, следует держать его на безопасном расстоянии от восприимчивых тканевых структур и избегать нежелательной коагуляции в результате случайного прикосновения или наложения инструмента.

Различные исследования⁽²⁻⁶⁾ подтвердили эффективность такого метода заваривания сосудов. Давление разрыва в этих исследованиях составляло более 400 мм рт.ст. более чем в 90% случаев (в некоторых случаях до 900 мм рт.ст.), что значительно выше обычных показателей артериального давления (примерно 130 мм рт.ст.).



Процесс заваривания сосуда

Гистологические исследования показали, что гемостаз при традиционной коагуля-

ции достигается за счет сморщивания стенок сосуда и образования тромба.

При лигировании, напротив, происходит денатурация коллагена со спаиванием противоположных слоев; при этом внутренняя эластичная мембрана остается почти нетронутой, поскольку ее волокна подвергаются денатурации при температуре выше 100 °С.

По бокам четко ограниченной зоны гомогенной коагуляции наблюдается переходная зона, в которой имеется термическое повреждение приблизительно 1-2 мм шириной, и зона иммуногистохимических изменений приблизительно в два раза шире. Далее развивается стерильное резорбтивное воспаление, преимущественно в окружающей соединительной ткани, без признаков даже временной несостоятельности зоны заваривания.

Преимуществами биполярного заваривания сосудов по сравнению с другими методами, такими как перевязка, швы и сосудистые клипсы, являются скорость подготовки, быстрое и надежное запечатывание сосудов, уверенность, что в теле пациента не будет оставлено никаких посторонних материалов и более низкая стоимость. Все это приводит к уменьшению времени операции, снижению кровопотери и, таким образом, к лучшему клиническому результату.



BOWA TissueSeal PLUS

Идея многократного применения позволяет сократить расходы, что является дополнительным стимулом для использования лигирующих инструментов NightKNIFE®, TissueSeal® и LIGATOR® компании BOWA.

Электролигирующие инструменты BOWA подходят для широкого спектра применений, включая открытые и лапароскопические операции в хирургии, гинекологии и урологии.

1.9 | ЭЛЕКТРОХИРУРГИЯ - ОБЩИЕ ПОЛОЖЕНИЯ⁽¹⁾

Пользователь должен быть знаком с назначением и применением аппаратов и инструментов (обучение и подготовка пользователей согласно Директиве «О медицинских изделиях» / прохождение тренинга у производителя).

1.9.1 | МЕРЫ БЕЗОПАСНОСТИ ДЛЯ ЦЕЛЕЙ ПРЕДОТВРАЩЕНИЯ ОСЛОЖНЕНИЙ В ХОДЕ ЭЛЕКТРОХИРУРГИЧЕСКИХ ВМЕШАТЕЛЬСТВ⁽¹⁾

- Проверка изоляции
- Использование наименьшей возможной эффективной мощности
- Активация тока должна быть краткой и с интервалами
- Активация недопустима при незамкнутой цепи тока
- Активация недопустима в непосредственной близости от других ВЧ инструментов или в прямом контакте с ними
- Использование биполярной электрохирургии

1.9.2 | НЕЙТРАЛЬНЫЕ ЭЛЕКТРОДЫ⁽¹⁾

Нейтральные электроды, как правило, поставляются в виде одноразовых принадлежностей для монополярной ВЧ хирургии и используются в качестве пассивной стороны для замыкания цепи тока между пациентом и ВЧ аппаратом.

Основной риск, связанный с неправильным использованием нейтрального электрода, заключается в локализации нагревания, вплоть до ожога, в месте контакта нейтрального электрода и некорректном использовании ВЧ аппарата.

Чтобы избежать проблем необходимо использовать нейтральные электроды без дефектов, в отличном рабочем состоянии. Необходимо учитывать желаемый терапевтический эффект, возраст и вес пациента (взрослые или дети). Кроме того, перед процедурой необходимо снять любые металлические и ювелирные изделия.

Место контакта нейтрального электрода с тканью выбирается так, чтобы токовая цепь между активным и пассивным электродами была как можно более короткой

и пролегал в продольном или диагональном направлении к телу пациента, поскольку мышцы обладают большей проводимостью в направлении волокон.

В зависимости от части тела, на котором совершается операция, нейтральный электрод должен быть присоединен как можно ближе к плечу или бедру, но не ближе 20 см от места хирургического вмешательства и на достаточном расстоянии от ЭКГ электродов или имплантатов (например, костных штифтов, костных пластин или искусственных суставов). Если пациент лежит на спине, то нейтральный электрод следует закреплять в верхней части тела так, чтобы он не размещался в области большого скопления жидкости. Электрод должен быть прикреплен к чистому и здоровому участку кожи без видимых повреждений и вне области активного роста волос. Если кожа подвергалась предварительному очищению, ее следует просушить перед прикреплением электрода. Электрод должен плотно прилегать к коже пациента.



Нейтральный электрод
BOWA EASY Universal

Необходим полный контакт нейтрального электрода с кожей, поскольку выделяемое тепло пропорционально площади контакта электрода. Встроенная функция контроля нейтрального электрода EASY в аппаратах

BOWA позволяет обеспечить максимальную безопасность пациента, не допуская монополярную активацию, если нейтральный электрод не достаточно плотно прилегает к коже.

Особое внимание следует обратить на пациентов с установленными кардиостимуляторами или кардиовертер-дефибрилляторами. Необходимо четко следовать инструкциям производителя и, при необходимости, обратиться за консультацией к кардиологу.

Побочных эффектов в ходе использования монополярных хирургических устройств во время беременности не зарегистрировано. Однако рекомендуется использовать биполярный метод из соображений безопасности.

Нейтральный электрод необходимо извлекать из упаковки непосредственно перед использованием; его можно использовать в течение семи дней с момента вскрытия упаковки при условии, что он хранился в сухом месте при температуре от 0 °C до 40 °C. Электроды, предназначенные для одноразового использования, после применения подлежат утилизации.

1.10 | ЦЕЛОСТНОСТЬ ОБОРУДОВАНИЯ

Все устройства, кабели и другое оборудование должны соответствовать установленным рабочим характеристикам и перед использованием подлежат проверке на наличие дефектов.

Проверьте бесперебойную работу устройств во всех предлагаемых рабочих режимах.

Не используйте повреждённые и загрязненные инструменты.

Если инструмент выходит из строя в процессе вмешательства, следует немедленно отключить питание, чтобы предотвратить

нежелательную утечку тока и повреждение тканей.

Ремонт оборудования и инструментов, которые вышли из строя, должен осуществляться только квалифицированными аттестованными специалистами.

Если педаль не используется, ее следует перенести на безопасное расстояние, чтобы исключить случайное нажатие.

1.11 | НЕЙРОМЫШЕЧНАЯ СТИМУЛЯЦИЯ (НМС)

НМС, или мышечные сокращения вследствие электрической стимуляции, это феномен, наблюдаемый в электрохирургии вообще и при монополярных процедурах в особенности.

Адекватное использование мышечных релаксантов значительно снижает риск НМС. Преимуществом является снижение вероятности случайного термического повреждения, последствием которого может стать перфорация кишечника при операциях, сопровождающихся таким риском.

1.12 | КОНТАКТ С ТОКОПРОВОДЯЩИМИ ОБЪЕКТАМИ

Чтобы предотвратить нежелательное движение тока и возможные повреждения, пациент должен быть в достаточной мере защищен от контакта с токопроводящими объектами.

Поэтому пациент должен лежать на сухой непроводящей ток поверхности.

Следует следить за тем, чтобы обеспечивать достаточное удаление от каких-либо металлических объектов в тех областях, где используются ВЧ устройства (такие как петли или АПК).



2 | ПРАКТИКА И МЕТОДЫ

Все большее распространение получает эндоскопический подход к хирургическим вмешательствам в гинекологии. Открытые хирургические вмешательства, однако, остаются важными при некоторых заболеваниях, таких как рак яичников. Почти все хирургические высокочастотные инструменты могут использоваться как для открытых, так и для эндоскопических операций. Основы современной ВЧ хирургии и ее применение в сфере гинекологии

описаны в данной брошюре. Кроме того, приведена информация о наиболее подходящих инструментах для различных хирургических вмешательств.

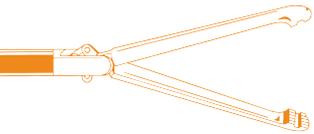
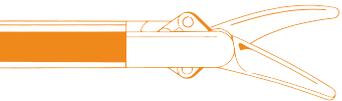
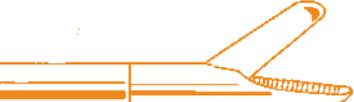
Эндоскопические и лапароскопические вмешательства теперь повседневно используются в клиниках. Несмотря на то, что связанные с технологией риски возникают достаточно редко, как и при открытых хирургических операциях могут быть

перфорации, повреждения окружающих тканей или кровотечения.

Понятия эндоскопия и лапароскопия подразумевают ряд процедур, которые называются в зависимости от их целей. Например, гастроскопия - визуальный осмотр внутренней поверхности желудка. Пельвиоскопия - это осмотр области таза.





| СТАНДАРТНАЯ УКЛАДКА ИНСТРУМЕНТОВ ДЛЯ ПЕЛЬВИОСКОПИИ ⁷ | |
|---|-------------------------------------|
|  | ИГЛА VERESS |
|  | ТРОАКАРЫ (11 И 6 ММ) |
|  | ЗАЖИМ ALLIS |
|  | ЗАЖИМ OVERHOLT |
|  | КЛЮВОВИДНЫЕ НОЖНИЦЫ |
|  | НОЖНИЦЫ METZENBAUM |
|  | БИОПСИЙНЫЙ ЗАЖИМ / ВЫКУСЫВАТЕЛЬ |
|  | ИГЛОДЕРЖАТЕЛЬ С ПРЯМЫМИ БРАНШАМИ |
|  | ТРУБКА ДЛЯ ОТСАСЫВАНИЯ / ПРОМЫВАНИЯ |



2.1 | ГИСТЕРОСКОПИЯ^{7,8}

Гистероскопия - это эндоскопический метод исследования, диагностики и хирургического лечения в полости матки, а также в канале шейки матки. Инструмент вводят через влагалище. В зависимости от диаметра инструмента может потребоваться расширить канал шейки матки. Резектоскоп может использоваться для удаления тканей.

Высокочастотный ток применяется для остановки кровотечения и удаления тканей.

Показания к гистероскопии:

- нарушения менструального цикла
- несоответствующие нормам результаты УЗИ
- наличие доброкачественных и злокачественных

венных опухолей матки

- удаление полипов и миоматозных узлов, выступающих в полость матки
- выявление факторов, которые могут привести к бесплодию, например, неправильное развитие или рост полости матки (внутриматочной перегородки)
- наблюдение после предыдущего вмешательства на матке
- установка и удаление внутриматочной спирали

Резектоскоп может использоваться для проведения следующих процедур в рамках гистероскопии:

- Абляция/резекция эндометрия
- Удаление миом
- Удаление полипов
- Разделение перегородки
- Удаление новообразований из полости матки

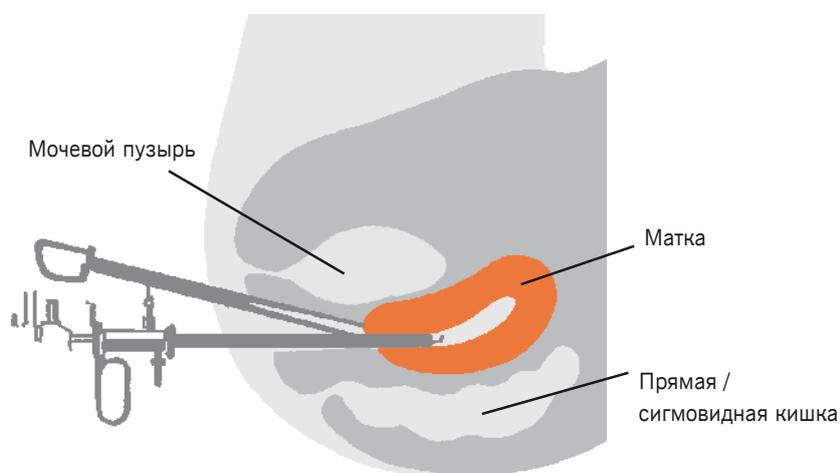
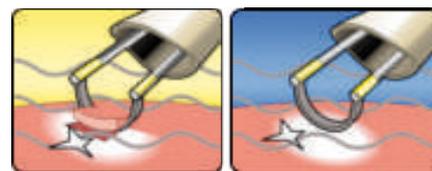


Схема гистероскопии



Значки режимов «резекция» для резки и коагуляции

Несмотря на то, что использование резектоскопа представляет собой надежный и проверенный метод вмешательства, существуют возможные риски и осложнения, например перфорация, разрыв или кровотечение. Необходимо следовать инструкциям производителя, которые приведены в Руководстве пользователя.

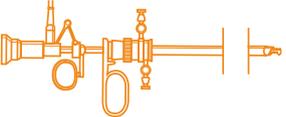
В зависимости от конкретной ситуации могут использоваться монополярные или биполярные электроды, а также петли или шаровидные электроды.

При применении монополярной методики необходимо использование безэлектролитного промывного раствора. Такое осложнение, как гипотоническая гипергидратация, возникает редко («ТУР синдром»). Если безэлектролитный промывной раствор попадет в кровоток, это может привести к гипонатриемии и гиперволемии.

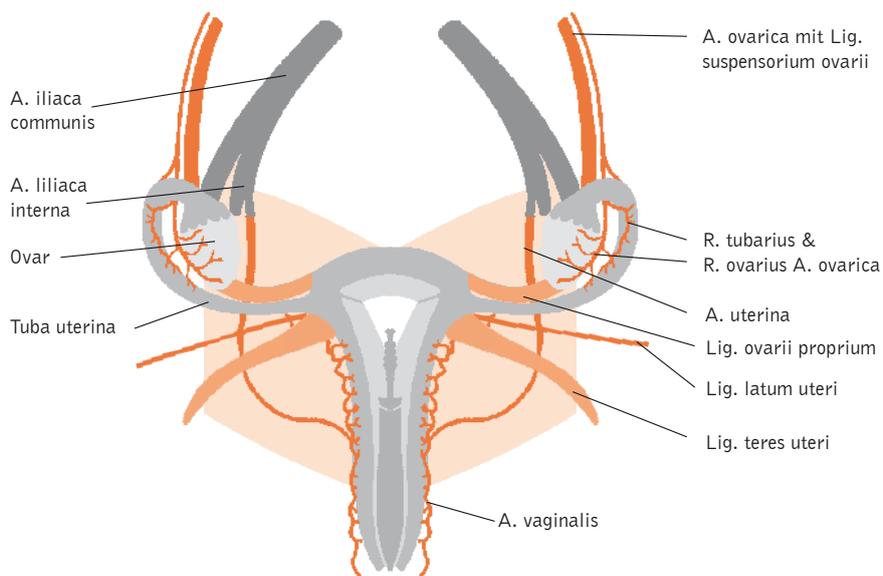
Возможные последствия включают в себя нарушения кровообращения с тошнотой и спутанностью сознания. Подобные осложнения возникают редко при проведении процедуры опытными специалистами. Их можно свести к минимуму, используя биполярный резектоскоп^(9, 10).

Адгезиолизис может быстро и эффективно осуществляться у пациентов с приросшей плацентой или прорастающей плацентой путем аргонеплазменной коагуляции в ходе гистероскопии⁽¹¹⁻¹³⁾.

РЕКОМЕНДУЕМЫЕ ИНСТРУМЕНТЫ ДЛЯ ГИСТЕРОСКОПИИ⁷

| | |
|---|--|
|  | <p>ВЧ-АППАРАТ ARC 400</p> |
|  | <p>РЕЗЕКТОСКОП (МОНОПОЛЯРНЫЙ ИЛИ БИПОЛЯРНЫЙ)</p> |
|  | <p>ВОЛОКОННО-ОПТИЧЕСКИЙ СВЕТОВОД</p> |
|  | <p>ОПТИКА HOPKINS</p> |
|  | <p>ОДНОЗУБЫЙ (ПУЛЕВОЙ) ЗАЖИМ SCHROEDER</p> |
|  | <p>МАТОЧНЫЕ РАСШИРИТЕЛИ HEGAR</p> |
|  | <p>ВЛАГАЛИЩНОЕ ЗАРКАЛО KRISTELLER</p> |
|  | <p>КЮРЕТКИ RECAMIER ИЛИ SIMS</p> |
|  | <p>МАТОЧНЫЙ ЗОНД SIMS</p> |

2.2 | РЕЗЕКЦИЯ ПРИДАТКОВ



Анатомический обзор матки

Наиболее частым поводом для одностороннего или двустороннего удаления придатков (=яичников и маточных труб; аднексэктомия, сальпингоовариоэктомия) является подозрение на злокачественную опухоль в этой области, внематочная беременность или перекрут яичника.

Сальпингэктомия (без удаления яичников) иногда необходима из-за трубной беременности. Односторонняя овариэктомия иногда требуется в связи с наличием кист

или перекрутом яичника, а двусторонняя овариэктомия - для сокращения выработки гормонов, например, у пациентов с карциномой молочной железы.

Лапароскопия может выполняться у пациентов с подозрением на изменения в придатках с целью подтверждения. При подозрении на опухоль, яичник должен быть полностью удален, эндоскопически или в ходе открытой операции, в зависимости от обстоятельств. Пациентам с оче-

видной злокачественной опухолью показано адекватное стадии опухоли открытое оперативное вмешательство в сочетании с химиотерапией препаратами платины. Результат такого лечения станет определяющим фактором при прогнозировании течения карциномы яичника. Решение о проведении лимфаденэктомии, двусторонней аднексэктомии, ХЭ, резекции брюшины, оментэктомии и т.д. будет принято с учетом стадии опухоли и других факторов, таких как возраст, сопутствующие заболевания и прочее.

В случае очевидного злокачественного новообразования и в пограничных случаях следует производить забор ткани во время операции для гистохимии, а также стадирование с возможной лимфаденэктомией. Дальнейшие манипуляции следует обсудить с гинекологом-онкологом¹⁴⁻¹⁶.

Возможно, потребуется электрохирургическое воздействие. Например, биполярное заваривание сосудов имеет особое значение для перекрытия содержащих сосуды поддерживающих связок, таких как связка, подвешивающая яичник. Кроме того, оно играет важную роль в ходе оментэктомии.

Чувствительные ткани необходимо защитить от нежелательного воздействия температуры.

РЕКОМЕНДОВАННЫЕ ИНСТРУМЕНТЫ ДЛЯ ЛАПАРОСКОПИЧЕСКОЙ АДНЕКСЭКТОМИИ
(ДОПОЛНИТЕЛЬНО К СТАНДАРТНОЙ ПЕЛЬВИОСКОПИЧЕСКОЙ УКЛАДКЕ)*

| | |
|---|---|
|  | ВЧ-АППАРАТ ARC 400 |
|  | БИПОЛЯРНЫЙ ЛАПАРОСКОПИЧЕСКИЙ ИНСТРУМЕНТ ДЛЯ КОАГУЛЯЦИИ ERGOLAP |
|  | ОТСОСНАЯ ТРУБКА |

2.3 | ГИСТЕРЭКТОМИЯ

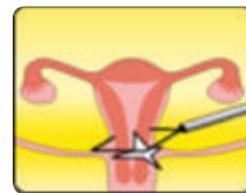
По разным причинам может потребоваться полное или частичное удаление матки, например, в случае дисфункционального нарушения менструального цикла, не чувствительного к медикаментозной терапии, миомы (миоматоза матки), эндометриоза или опухолей¹⁷.

Доступ в ходе открытых и эндоскопических операций может осуществляться через брюшную полость или влагалище. Выбираемый способ зависит от различных факторов, среди которых поставленный диагноз, сопутствующие заболевания, а также опыт хирурга. Существуют следующие варианты

процедур: абдоминальная гистерэктомия, влагалищная гистерэктомия, полностью лапароскопическая гистерэктомия, лапароскопически ассистированная влагалищная гистерэктомия, лапароскопически ассистированная супрацервикальная гистерэктомия (ампутация матки) и расширенная лапароскопически ассистированная супрацервикальная гистерэктомия¹⁸.

Все поддерживающие связки с артериями и венами могут быть заварены с помощью биполярной методики в ходе гистерэктомии, за исключением связок, которые идут кзади, к прямой кишке и крестцу. Биполярное запечатывание сосудов значительно сократит время проведения абдоминальной экстирпации матки¹⁹.

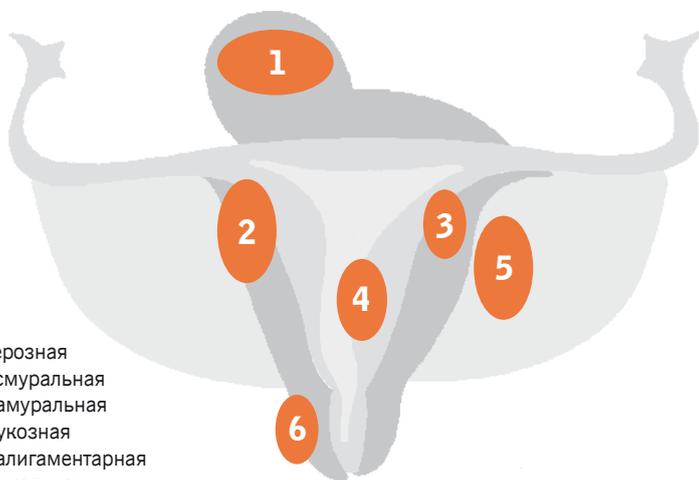
Могут применяться и другие электрохирургические методики, например, для рассечения брюшной стенки и для остановки кровотечения. Биполярное заваривание сосудов значительно сократит время проведения операции, уменьшит кровопотерю и необходимость переливания крови²⁰.



Значок режима «гинекологическая петля MetraLOOP»

Важно не допустить термического повреждения мочеточников и сохранять достаточный безопасный край в отношении чувствительных к воздействию температур окружающих тканей в этой области, в особенности нервов и кишечника.

В ходе эндоскопической гистерэктомии, электролигирующий инструмент помогает пересечь верхний поддерживающий аппарат с собственными связками яичников и круглыми связками. Трубы и широкие связки матки могут быть скоагулированы и пересечены. При лапароскопически ассистированной ампутации матки помочь удалить тело матки могут петли, при значительном сокращении времени операции и повышении уровня безопасности в части риска повреждений мочевого пузыря и кишечника.



- Миома:
- 1 - Субсерозная
 - 2 - Трансмуральная
 - 3 - Интрамуральная
 - 4 - Субмукозная
 - 5 - Интралигаментарная
 - 6 - Цервикальная

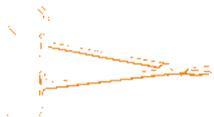
Расположение миом

РЕКОМЕНДОВАННЫЕ ИНСТРУМЕНТЫ ДЛЯ ЛАПАРОСКОПИЧЕСКИ-АССИСТИРОВАННОЙ ВЛАГАЛИЩНОЙ ГИСТЕРОЭКТОМИИ И ВЛАГАЛИЩНОЙ ГИСТЕРОЭКТОМИИ (ДОПОЛНИТЕЛЬНО К СТАНДАРТНОЙ ПЕЛЬВИОСКОПИЧЕСКОЙ УКЛАДКЕ)⁷

| | |
|---|---|
|  | <p>ВЧ-АППАРАТ ARC 400</p> |
|  | <p>БИПОЛЯРНЫЙ ЛАПАРОСКОПИЧЕСКИЙ ИНСТРУМЕНТ ДЛЯ КОАГУЛЯЦИИ ERGOLAP</p> |
|  | <p>ЗАЖИМЫ ДЛЯ ЛИГИРОВАНИЯ TISSUESEAL PLUS</p> |
|  | <p>БИПОЛЯРНЫЕ НОЖНИЦЫ</p> |
|  | <p>ЗЕРКАЛО SCHERBACK</p> |
|  | <p>ВЛАГАЛИЩНОЕ ЗЕРКАЛО DOYEN</p> |
|  | <p>ГИСТЕРОЭКТОМИЧЕСКИЕ ЗАЖИМЫ WERTHEIM</p> |
|  | <p>ОДНОЗУБЫЙ (ПУЛЕВОЙ) ЗАЖИМ SCHROEDER</p> |
|  | <p>НОЖНИЦЫ SIMS</p> |
|  | <p>НОЖНИЦЫ COOPER</p> |
|  | <p>ЗАЖИМЫ REAN</p> |
|  | <p>ЗАЖИМЫ MIKULITZ</p> |
|  | <p>ИГЛОДЕРЖАТЕЛЬ HEGAR</p> |



РЕКОМЕНДОВАННЫЕ ИНСТРУМЕНТЫ ДЛЯ ЛАПАРОСКОПИЧЕСКОЙ АМПУТАЦИИ МАТКИ (ДОПОЛНИТЕЛЬНО К СТАНДАРТНОЙ ПЕЛЬВИОСКОПИЧЕСКОЙ УКЛАДКЕ)⁷

| | |
|--|--|
|  | ВЧ-АППАРАТ ARC 400 |
|  | БИПОЛЯРНЫЙ ЛАПАРОСКОПИЧЕСКИЙ ИНСТРУМЕНТ ДЛЯ КООГУЛЯЦИИ ERGOLAP |
|  | ЛАПАРОСКОПИЧЕСКИЙ ИНСТРУМЕНТ ДЛЯ ЛИГИРОВАНИЯ NIGHTKNIFE |
|  | МАТОЧНЫЙ МАНИПУЛЯТОР NONL |
|  | ИГЛОДЕРЖАТЕЛЬ HEGAR |

РЕКОМЕНДОВАННЫЕ ИНСТРУМЕНТЫ ДЛЯ ЛАПАРОСКОПИЧЕСКОЙ ЭКСТИРПАЦИИ МАТКИ (ДОПОЛНИТЕЛЬНО К СТАНДАРТНОЙ ПЕЛЬВИОСКОПИЧЕСКОЙ УКЛАДКЕ)⁷

| | |
|---|--|
|  | ВЧ-АППАРАТ ARC 400 |
|  | ПЕТЛЯ ДЛЯ УДАЛЕНИЯ МАТКИ METRALOOP |
|  | БИПОЛЯРНЫЙ ЛАПАРОСКОПИЧЕСКИЙ ИНСТРУМЕНТ ДЛЯ КООГУЛЯЦИИ ERGOLAP |
|  | ЛАПАРОСКОПИЧЕСКИЙ ИНСТРУМЕНТ ДЛЯ ЛИГИРОВАНИЯ NIGHTKNIFE |
|  | МОРЦЕЛЛЯТОР ERGO 300 |
|  | МАТОЧНЫЙ МАНИПУЛЯТОР |



2.4 | ЭНДОМЕТРИОЗ

Эндометриоз определяется, как наличие скоплений эндометрий-подобных клеток вне полости матки. Это одно из самых распространенных гинекологических заболеваний в детородном возрасте, которое считается зависимым от выработки эстрогена. Основным симптомом является боль в нижней части живота и бесплодие, как частое сопутствующее состояние. Заслуживают внимания показатели заболеваемости и осложнений.

Поскольку этиология и патогенез эндометриоза не до конца выяснены, до настоящего времени не существует и этиотропного лечения. Тем не менее, для устранения симптомов и сокращения общего уровня заболеваемости были разработаны как диагностические, так и терапевтические методы.

С точки зрения патологии/гистологии, эндометриоз представляет собой заболевание с доброкачественным течением. Тем не менее, оно может распространяться на другие органы и требовать обширного хирургического вмешательства.

Первоочередная цель лечения заключается в лапароскопическом удалении скопле-

ний клеток в брюшине. Неясно, насколько отличаются по эффективности разные способы воздействия - коагуляция, выпаривание и иссечение.

Самым эффективным способом лечения эндометриоза яичников является хирургическое удаление его очагов.

Хирургическая лапароскопия является наиболее подходящим методом^{21, 22}.

Кокрановский анализ показал, что лучшие результаты в части уменьшения боли и рецидивов, и возможности забеременеть были достигнуты после удаления (экстракции) оболочки кисты с сохранением яичника по сравнению с термическим разрушением посредством высокочастотного тока, лазерной вапоризации и аргоноплазменной коагуляции.



Значок режима «аргон»

Исключительно медикаментозное лечение эндометриоза неэффективно и не рекомендовано. Применение аналога гонадотропин-релизинг гормона (ГнВГ) перед операцией может привести к уменьшению размеров эндометрия. Санационная резекция - предпочтительный вариант для симптоматического глубокого инфильтративного эндометриоза. Возможны различные подходы, включая вагинальную резекцию, лапароскопию, лапароскопически ассистированный влагалищный доступ и лапаротомию. Если эндометриоз распространился на другие органы, например, ректосигмовидный отдел ободочной кишки, мочевого пузыря и мочеточник, следует провести предварительную подготовку к операции и собрать консилиум из специалистов в висцеральной хирургии и урологии. Если пациент хочет в дальнейшем иметь детей, необходимо сохранить матку, в связи с чем, возможно, резекция очагов эндометриоза будет неполной²¹.

При лапароскопии скопления очагов эндометриоза в большинстве случаев можно эффективно удалить с помощью аргоноплазменной коагуляции²³⁻²⁵.



| РЕКОМЕНДОВАННЫЕ ИНСТРУМЕНТЫ ДЛЯ РЕЗЕКЦИИ ЭНДОМЕТРИОЗА (ДОПОЛНИТЕЛЬНО К СТАНДАРТНОЙ ПЕЛЬВИОСКОПИЧЕСКОЙ УКЛАДКЕ) | |
|---|---|
|  | ВЧ-АППАРАТ ARC 400 |
|  | АППАРАТ ПОДАЧИ АРГОНА ARC PLUS |
|  | АРГОНОПЛАЗМЕННЫЙ ДЕРЖАТЕЛЬ ЭЛЕКТРОДОВ С ЭЛЕКТРОДАМИ |
|  | БИПОЛЯРНЫЙ ЛАПАРОСКОПИЧЕСКИЙ ИНСТРУМЕНТ ДЛЯ КОАГУЛЯЦИИ ERGOLAP |



2.5 | МАСТЭКТОМИЯ

Самым частым показанием к мастэктомии является рак. Целью хирургического вмешательства является удаление первичной опухоли с достаточным безопасным краем и возможная лимфаденэктомия (сторожевого узла, подмышечная лимфодиссекция). В зависимости от диагноза, может быть сохранена часть ткани груди (резекция: сегментэктомия или квадрантэктомия) или выполнена (модифицированная) радикальная мастэктомия, если необходимо с подмышечными лимфатическими узлами, что также возможно при технике сторожевого узла. Может применяться и неoadъювантная терапия.

Лечение с сохранением молочной железы и последующим облучением всей груди соответствует по показателю выживаемости модифицированной радикальной мастэктомии.

Модифицированная радикальная мастэктомия проводится в следующих случаях:

- Обширная диффузная кальцификация злокачественного характера
- Многоочаговость
- Неполное удаление опухоли (включая внутрипротоковые компоненты), даже после повторной резекции
- Воспалительная карцинома молочной железы (также после успешной неoadъю-

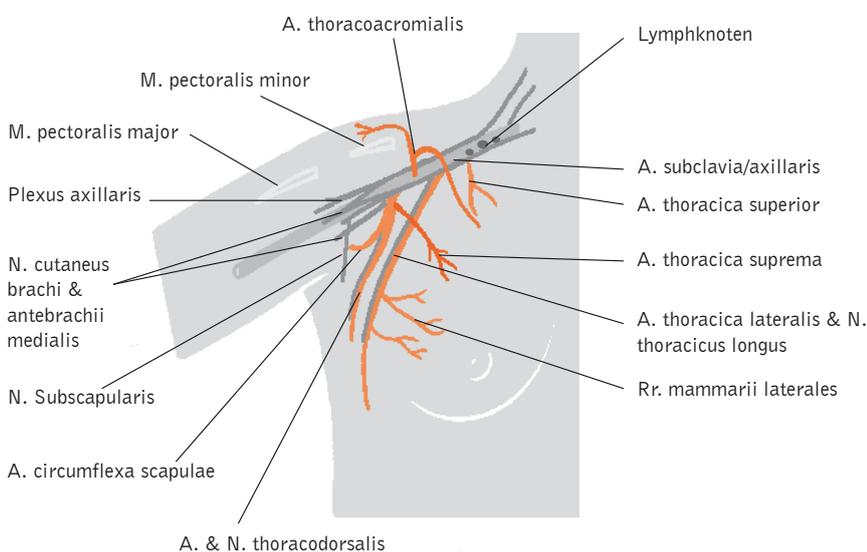
вантной терапии)

- Ожидаемый неудовлетворительный косметический результат после лечения с сохранением груди
- Противопоказания для последующего облучения после лечения с сохранением груди
- Желание пациента после объяснения соотношения польза/риск²⁶

По возможности необходимо следовать действующему Руководству S3, в противном случае может быть значительно худший исход²⁷.



Значок режима
«форсированный смешанный»

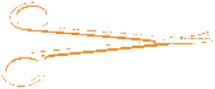


Анатомический обзор сосудистой системы молочной железы

Электротомия и электрокоагуляция могут использоваться при операциях на груди и в области подмышечной впадины вместе с биполярным завариванием кровеносных сосудов. Чтобы избежать чувствительных нарушений или паралича, следует соблюдать осторожность и не повреждать нервы в области операции (например, длинный грудной нерв и ветви плечевого сплетения, такие как грудоспинальный нерв).

Чтобы обеспечить хирургу хороший обзор, рекомендуется применение системы отведения хирургического дыма.



| РЕКОМЕНДОВАННЫЕ ИНСТРУМЕНТЫ ДЛЯ МАСТЭКТОМИИ ²⁸ | |
|---|-------------------------------------|
|  | ВЧ-АППАРАТ ARC 400 |
|  | СИСТЕМА ЭВАКУАЦИИ ДЫМА BOWA SHE SHA |
|  | БИПОЛЯРНЫЕ НОЖНИЦЫ BIZZER |
|  | ПРЕПАРОВОЧНЫЕ НОЖНИЦЫ |
|  | КОЖНЫЕ КРЮЧКИ |
|  | КРЮЧКИ ROUX |



2.6 | КОНИЗАЦИЯ ШЕЙКИ МАТКИ⁷

Конизация шейки матки выполняется, если в ходе скрининга на рак выявлены внушающие беспокойство результаты цитологии (мазок из шейки матки), или если после кольпоскопии (исследования влагалища и шейки матки под микроскопом с увеличением от $\times 3,5$ до $\times 30$) и забора тканей требуется дальнейшее прояснение ситуации.

Конизация показана в следующих случаях⁷:

- Необходимость полного гистологического исследования при интраэпителиальной цервикальной неоплазии
- Расхождения в результатах цитологии и кольпоскопии
- Отсутствие заметных изменений шейки матки

Конизация - это хирургическая процедура²⁹, которая обычно проводится под полной или частичной анестезией, в редких случаях - под местной анестезией. В ходе данной процедуры удаляют ткани в области наружного маточного зева. Конизация может выполняться с использованием разных хирургических техника (скальпель, лазер или электрическая петля). Предпочтительный способ сейчас - использование электрической петли: петлевое иссечение зоны трансформации.



Электрод-петля

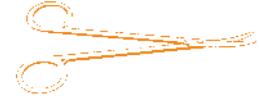
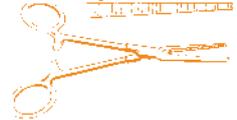
Перед вмешательством мочевой пузырь пациента полностью опустошают путем введения катетера. После проведения дезинфекции, открытия влагалища и, в отдельных случаях, после местного введения препарата в матку для уменьшения

кровотечения, удаляют ткани в форме конуса в области наружного маточного зева. Глубина и ширина конуса будут зависеть от возраста пациента и результатов дооперационных исследований. Если операция выполняется с помощью электрической петли, чаще всего удалению подлежит меньшее количество ткани, чем при классической ножевой конизации.

Чтобы обеспечить хирургу хороший обзор, рекомендуется применение системы отведения хирургического дыма.

Выскабливание шейки матки проводится с помощью кюретки. В конце операции производят электрическое заваривание образовавшейся раневой поверхности. В редких случаях для остановки вагинального кровотечения применяют тампонирующее; тампон удаляют через несколько часов.

РЕКОМЕНДОВАННЫЕ ИНСТРУМЕНТЫ ДЛЯ КОНИЗАЦИИ⁷

| | |
|---|--|
|  | <p>ВЧ-АППАРАТ ARC 400</p> |
|  | <p>СИСТЕМА ЭВАКУАЦИИ ДЫМА BOWA SHE SHA</p> |
|  | <p>ЭЛЕКТРОД-ШАРИК</p> |
|  | <p>ЭЛЕКТРОД-ПЕТЛЯ</p> |
|  | <p>МАТОЧНЫЕ НОЖНИЦЫ SIMS</p> |
|  | <p>НОЖНИЦЫ METZENBAUM</p> |
|  | <p>НОЖНИЦЫ COOPER</p> |
|  | <p>ЗАЖИМЫ РЕАН</p> |
|  | <p>ЗАЖИМ KOCHER</p> |

3

ЧАСТО ЗАДАВАЕМЫЕ ВОПРОСЫ - BOWA В ГИНЕКОЛОГИИ

Как работает система EASY?

Система EASY контролирует составные нейтральные электроды, следит за качеством прилегания электрода к телу пациента и в случае его нарушения останавливает работу монополярного устройства, поэтому риск ожогов в месте контакта с электродом сводится к минимуму.

При наложении нейтрального электрода устанавливается эталонное контактное сопротивление. Если измеряемое сопротивление на нейтральном электроде на 50% выше, чем эталонное, система EASY останавливает активацию, подает звуковой сигнал и выводит на дисплей код ошибки.

В чем преимущества биполярной резекции?

При биполярных методах электрический ток проходит локально между двумя электродами инструмента. Таким образом, ткань нагревается местно и снижается риск повреждения глубже лежащих структур. Поскольку нейтральный электрод не используется, нет опасности ожога тканей.

Биполярная резекция допускает использование NaCl в качестве проводящей ирригационной жидкости, таким образом, уменьшается риск развития ТУР синдрома.

Что такое ТУР синдром?

В случае применения монополярного метода используется непроводящая ток ирригационная жидкость, и если значительное количество жидкости попадает через поврежденные вены в кровь, то это приводит к повышению объема внеклеточной жидкости, нарушению электролитного баланса и гипонатриемии.

Это может оказать негативное влияние на различные части тела: на центральную нервную систему (например, головные боли, отек головного мозга, судороги и кома), сердечно-сосудистую систему (нарушения кровяного давления, отек легких, цианоз) или стать причиной системных нарушений (боль в желудке, гипотермия и нарушения свертываемости крови, такие как диссеминированная внутрисосудистая коагулопатия).

В чем риски биполярной резекции?

Ирригация должна быть постоянной, при этом следует избегать постоянных включений системы, чтобы не возникло осложнений, связанных с нагреванием ирригационной жидкости.

Если используется резектоскоп с проводящим внешним тубусом, то следует применять проводящие смазочные гели,

поскольку иначе можно повредить ткани матки.

Сохраняется ли риск непроизвольных движений пациента при проведении биполярной резекции?

Риск возникновения данной проблемы при проведении биполярной резекции гораздо меньше, но если операция проводится в непосредственной близости от нервов, рекомендуется использовать анестетики.

В чем цель функции BOWA ARC CONTROL?

Минимальный уровень мощности, требуемый для воспроизводимого тканевого эффекта, может быть достигнут за долю секунды благодаря дуге, таким образом, только минимальное количество требуемой энергии доставляется к пациенту.

Как задается эффект биполярной резекции на инструменте?

Доступны три уровня эффекта: эффект 1 используется для электродов-игл/электродов-ножей и маленьких петель, эффект 2 - для резекционных электродов-петель, и эффект 3 - для вапоризации.

Почему требуется высокая мощность в начале резания?

Первоначальная высокая мощность резания облегчает немедленное образование дуги, что способствует ровному резанию без рывков. Высокая мощность подается непосредственно только во время начального разреза, затем за долю секунды происходит понижение до постоянного значения. Аппараты ARC 400 и ARC 350 обладают необходимыми для этого характеристиками.

В чем задача кабеля BOWA COMFORT?

Вилка снабжена встроенным чипом радиочастотной идентификации (RFID), с его помощью распознается подключенный инструмент. Параметры выбираются автоматически в сочетании с предварительными настройками мощности, необходимыми для применения.

Какие резектоскопы можно использовать?

Компания BOWA предлагает соединительный кабель для монополярных и биполярных резектоскопов Storz, Wolf и Olympus.

Можно ли использовать соединительные кабели от производителей резектоскопов с аппаратами компании BOWA?

С аппаратами BOWA ARC для биполярной

резекции могут использоваться только соединительные кабели компании BOWA, поскольку эти кабели отвечают требованиям по высокой первоначальной мощности резания и оснащены чипом для обеспечения максимальной эффективности.

Можно ли использовать кабели BOWA с устройствами других производителей?

Соединительные кабели были разработаны специально для аппаратов BOWA ARC с функцией COMFORT и не совместимы с устройствами других производителей.

Можно ли использовать аппарат BOWA ARC в других областях?

Аппараты BOWA ARC могут использоваться во всех областях электрохирургии.

Можу ли я использовать принадлежности от других производителей?

Стандартные принадлежности могут быть напрямую присоединены через подходящий разъем.

Можно ли использовать аппарат BOWA ARC 400 для заваривания сосудов?

В аппарате BOWA ARC 400 предусмотрена функция электролигирования, а также ряд инструментов для лапароскопических и открытых хирургических операций.

Каков срок службы кабелей BOWA COMFORT?

Компания BOWA гарантирует срок службы кабелей с функцией идентификации инструментов, равный 100 циклам автоклавирования.

Количество использований фиксируется в инструменте BOWA COMFORT и может быть считано. Ответственность за использование кабелей за пределами установленного периода лежит непосредственно на пользователе.

Как определить, инструмент предназначен для многоразового или одноразового использования?

Одноразовые инструменты BOWA снабжены соответствующим символом «одноразового применения».



Внимательно прочтите инструкцию перед началом использования инструмента.



4 | РЕКОМЕНДОВАННЫЕ ОПЕРАЦИИ ПО НОЗОЛОГИЧЕ- СКОМУ ПРИНЦИПУ

Отдельные вмешательства обычно проводятся в конкретных диагностических ситуациях. В таблице ниже приведены примеры вмешательств (в соответствии с OPS [Германская кодировка медицинских процедур] 2014) и рекомендованных диагностических центров (в соответствии с «Внутренней классификацией заболеваний», ICD 10 GM). В зависимости от клинической ситуации и применимых стандартов конкретной медицинской дисциплины, может потребоваться отклонение от указанной здесь информации. Необходимо всегда следовать применимым стандартам соответствующей медицинской дисциплины.





| ВМЕШАТЕЛЬСТВА (OPS [СИСТЕМА КОДИРОВАНИЯ МЕДИЦИНСКИХ ВМЕШАТЕЛЬСТВ В ГЕРМАНИИ] 2014) | ДИАГНОЗ (ICD 10-GM) |
|--|---|
| Гистероскопия (OPS 1-672) | Как диагностика Обнаружение внутриматочного кровотечения Выявление возможных патологий Стадирование карциномы эндометрия Наблюдение за гиперплазией эндометрия Проверка непонятных результатов цитологии Поиск причин бесплодия Диагностика врожденных аномалий матки Как лечение Инородные тела в полости матки (T19.3) Полипы тела матки (N84.0) Миома матки (D25.-) Эндометриоз (N80.0) Внутриматочные синехии (N85.6) Врожденные аномалии матки (Q51.-) Трансцервикальный доступ к маточным трубам |
| Резекции придатков (OPS 5-651, 5-652) | Фолликулярные кисты яичника (N83.0) Кисты яичника (N83.2) Перекрут яичника (N83.5) Карцинома яичника (C56.-) Внематочная беременность (O00.1) Оофорит (N70.-) Неизвестная неоплазия в яичниках (D39.1) Доброкачественная неоплазия в яичниках (D27.-) |
| Гистерэктомия (OPS 5-683) | Полипы в теле матки (N84.-) Доброкачественная неоплазия в матке (D24.-, D25.-) Злокачественная неоплазия в матке (C54.-) Эндометриоз (N80.-) Опущение матки (N81.2-4) |
| Мастэктомия (OPS 5-87) | Доброкачественная неоплазия в молочной железе (D24.-) Злокачественная неоплазия в молочной железе (C50.-) Полимастия (N62.-) |
| Конизация шейки матки (OPS 5-671) | Как диагностика Необходимость полного гистологического исследования у пациентов с интраэпителиальной цервикальной неоплазией. Расхождения в результатах цитологии и кольпоскопии. Отсутствие заметных изменений в области шейки матки |
| Пластическая реконструкция маточной трубы (тубопластика; OPS 5-666) | Трубное бесплодие (N97.1) |



5

РЕКОМЕНДОВАННЫЕ НАСТРОЙКИ: КРАТКИЙ КУРС

Рекомендованные настройки представлены в таблице ниже. В зависимости от клинической ситуации и применимых стандартов конкретной медицинской дисциплины, может потребоваться отклонение от указанной здесь информации. Необходимо всегда следовать применимым стандартам соответствующей медицинской дисциплины.

Несмотря на то, что компания BOWA-electronic GmbH & Co. KG («БОВА-электроник ГмбХ и Ко. КГ») приложила все возможные усилия при составлении данной брошюры, однако полностью исключить возможные неточности невозможно.

Компания BOWA не несет ответственности за любые убытки, связанные с использованием настроек или иной содержащейся здесь информации. Юридическая ответственность ограничена умыслом и преступной небрежностью.

Информация по рекомендованным настройкам, способам применения, продолжительности применения и порядку использования основана на клиническом опыте. Медицинские учреждения и врачи могут использовать настройки, отличные от рекомендованных.

Показатели и значения приведены только для ознакомления в качестве ориентировочных.

С учетом конкретных обстоятельств может потребоваться изменить настройки.

Благодаря непрекращающимся исследованиям и наработкам в области клинического применения медицинские технологии постоянно развиваются. Именно по этим причинам пересмотр приведенной в брошюре информации может быть весьма полезным.

| ДОСТУП | ОПЕРАЦИЯ | МЕТОД | ИНСТРУМЕНТЫ | РЕЖИМ | | УСТАНОВКИ | | ПРИМЕЧАНИЯ |
|-----------------------------------|---|--|---|--|----------------------------|-----------|-------------------------------------|---|
| | | | | ЗНАЧОК | НАИМЕНОВАНИЕ | ЭФФЕКТ | МОЩНОСТЬ | |
| ЛАПАРОСКОПИЧЕСКОЕ ВМЕШАТЕЛЬСТВО | Ампутация матки (LASH) | Монопольный | Ампутация матки с петель (напр., MetraLOOP) | | Гинеколог. петля MetraLOOP | 2 | - | СОВЕТ: Сохраняйте отступ от соседних структур |
| | Лапароскопия, Гистерэктомия (напр., лапароскопически-ассистированная или полностью лапароскопическая ампутация и экстирпация матки), Резекция придатков матки, Операция по поводу эндометриоза, Перевязка маточных труб, Пластика маточных труб | | Монопольные лап. инструменты | | Лапароскопия | 3-6 | 70-100 Вт | Всегда следуйте общим правилам монопольного метода |
| | | | | | Лапароскопия | - | 40-90 Вт | |
| | | | | | Форсированный смешанный | 2-3 | 40-80 Вт | |
| | | | | | Аргон открытый | - | 60-100 Вт | |
| | Биполярный | Биполярные лап. инструменты | | Лапароскопия | - | 40-70 Вт | Не захватывайте слишком много ткани | |
| | | | | Биполярные лап. ножницы | - | 40-80 Вт | | |
| | | | | Биполярные ножницы | - | 40-80 Вт | | |
| | | | | Инструменты для электролигирования / заваривания | - | - | | |
| | ВЛАГАЛИЩНОЕ ВМЕШАТЕЛЬСТВО | Гистероскопия | Монопольный | Монопольный резектоскоп | | Резекция | 2-4 | - |
| | | | | | Резекция | - | 60-90 Вт | |
| Биполярный | | | Биполярный резектоскоп | | Биполярная резекция | 2 | - | Используйте в качестве промывной жидкости солевой раствор, когда коагулируете в контакте с тканью |
| | | | | | Биполярная резекция | - | 200-300 Вт | |
| Конизация шейки матки (влагищная) | | Монопольный | Инструменты для монопольной коагуляции (напр., электроды-петли, электроды-ножи) | | Стандарт | 3-7 | 80-150 Вт | Всегда следуйте общим правилам монопольного метода |
| | | | | | Форсированный смешанный | 2-3 | 40-80 Вт | |
| | | | | | Спрей | 2-4 | 80-120 Вт | |
| Гистерэктомия (влагищная) | | Биполярный | Инструменты для биполярной коагуляции (напр., пинцеты) | | Пинцет стандарт | - | 30-80 Вт | Не захватывайте слишком много ткани |
| | | | | | Пинцет стандарт AUTOSTART | - | 30-80 Вт | |
| | | | Биполярные ножницы | | Биполярные ножницы | - | 40-80 Вт | |
| | | | | Биполярные ножницы | - | 40-80 Вт | | |
| | | | Инструменты для электролигирования / заваривания | TissueSeal PLUS | - | - | | |
| ОТКРЫТЫЕ ВМЕШАТЕЛЬСТВА | Мастэктомия, Гистерэктомия, Пластика маточных труб | Монопольный | Инструменты для монопольной коагуляции (напр., электроды-петли, электроды-ножи) | | Стандарт | 3-7 | 80-150 Вт | Всегда следуйте общим правилам монопольного метода |
| | | | | | Форсированный смешанный | 2-3 | 40-80 Вт | |
| | | | | | Спрей | 2-4 | 80-120 Вт | |
| | | | | | SimCoag | 2 | 60-120 Вт | |
| | Биполярный | Инструменты для биполярной коагуляции (напр., пинцеты) | | Пинцет стандарт | - | 30-80 Вт | Не захватывайте слишком много ткани | |
| | | | | Пинцет стандарт AUTOSTART | - | 30-80 Вт | | |
| | | Биполярные ножницы | | Биполярные ножницы | - | 40-80 Вт | | |
| | | | | Биполярные ножницы | - | 40-80 Вт | | |
| | | | Инструменты для электролигирования / заваривания | TissueSeal PLUS | - | - | | |

6

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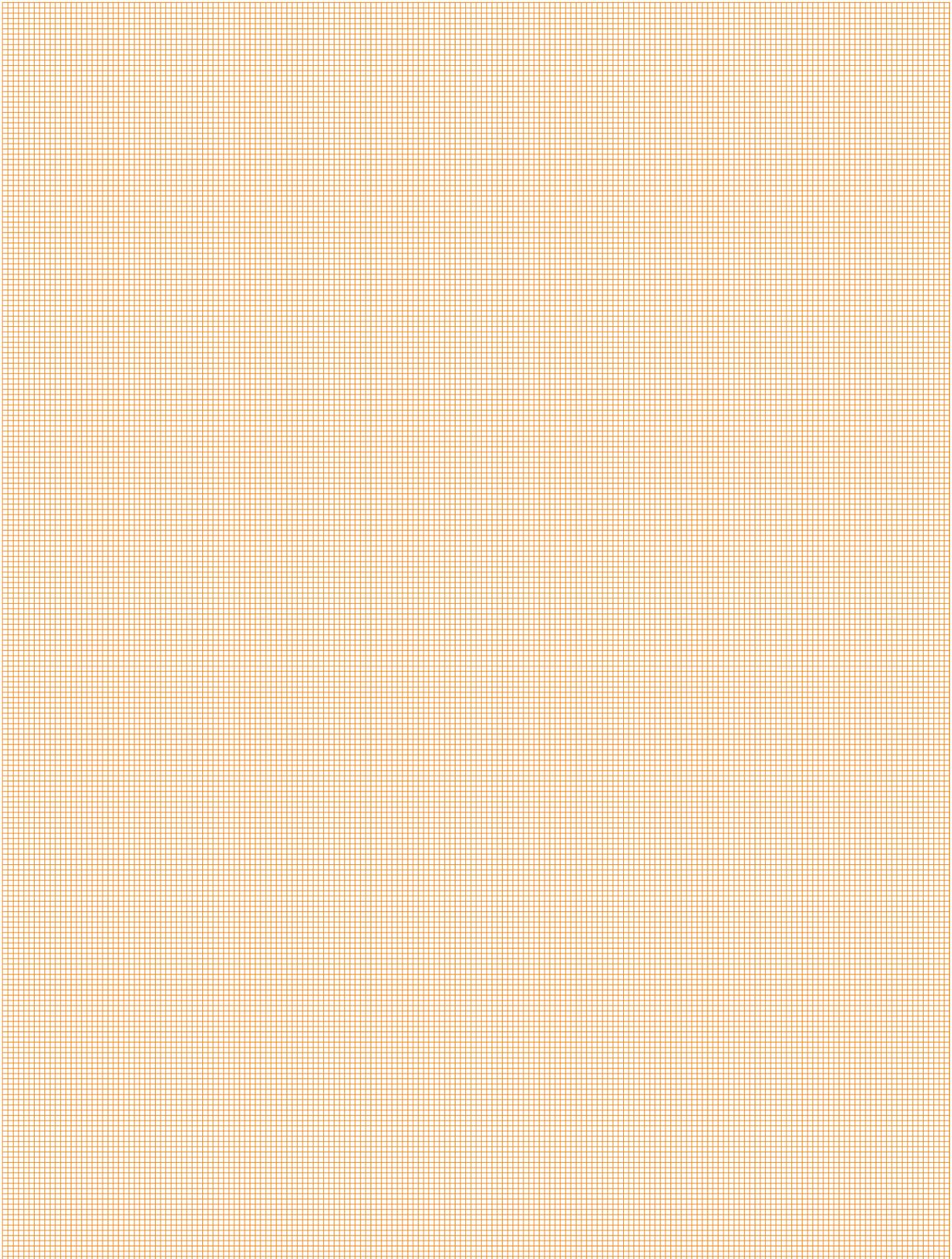
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For your notes



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