

ELECTROCAUTERY / ELECTROSURGERY ANALYZER

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Abstract. *Electro coagulators, EHF, electrosurgical high-frequency systems are all names of surgical devices for cutting tissue and quickly stopping bleeding.*

Keywords: *electrocautery, neurosurgery, dentistry, plastic surgery, gynecology.*

Electrocautery - is a device used to perform surgical procedures such as cutting, coagulation by passing high frequency and high energy electric current through the patient's body under the control of the doctor.



Electrocautery output powers range from 10 Watts to 400 Watts.

Types of electrocautery devices according to their power are listed below:

Low power electrocauterics (up to 100 Watt)

- Neurosurgery
- Dentistry
- Plastic surgery
- Gynecology

Medium power electrocauterics (200 Watt)

- General surgery
- Orthopedic surgery
- Cardiovascular surgery
- Urology

High power electrocauterics (up to 400 Watts)

- Cardiovascular surgery
- Cancer surgery
- Urology

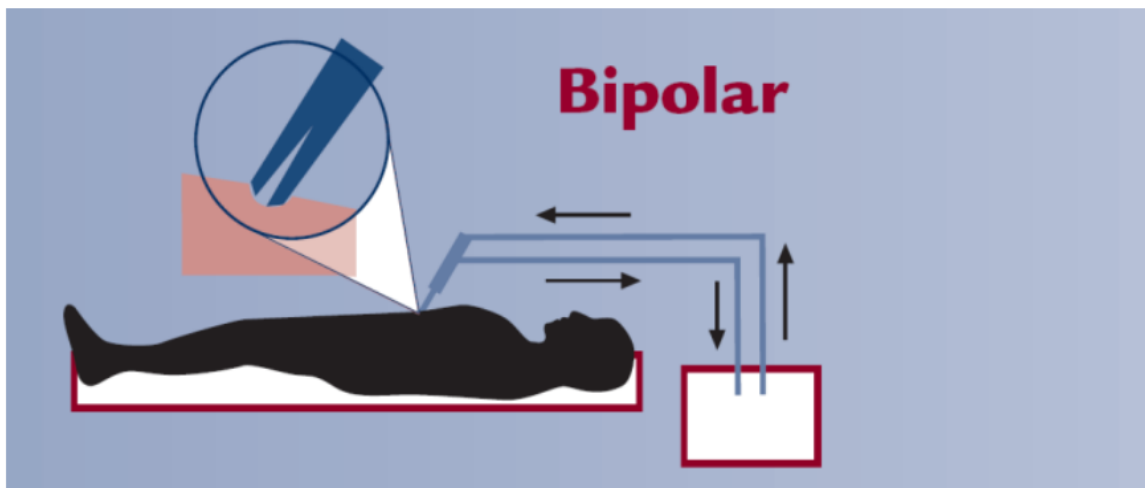
Electrocautery devices according to the connection of the patient output circuit

- Bipolar electrocautery device
- Monopolar electrocautery device

Bipolar Electrocautery Device

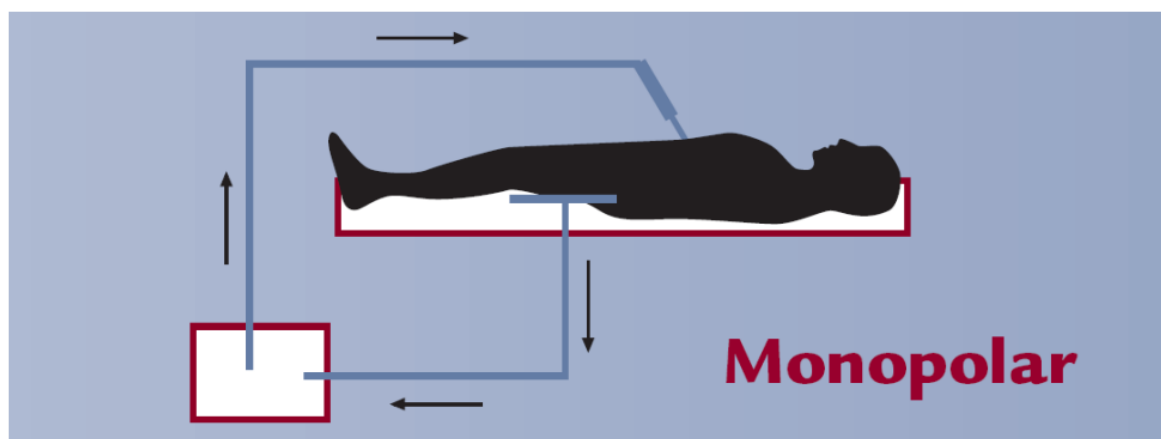
Output circuits are devices that are isolated from the chassis. For this reason, the return electrode is not used in these devices in general terms, instead it is used as a two-ended active electrode

(forceps). Since the electrocautery current can only pass through the tissue in contact between the two active electrodes, it does not harm even if one tip accidentally touches sensitive tissues. In fact, delay circuits set by the user are added for this type of outputs, so that tissue damage is not caused even if two active tips touch in accidental instantaneous contacts. This type of cautery is used in neurosurgery and other vascular surgical procedures that require careful study due to these important abilities. They cannot be used at powers higher than 50 Watts, as they only cause a high frequency high voltage on the patient compared to the ground.



Monopolar Electrocautery Device

These devices are devices whose patient output circuit is directly connected to the chassis or with a capacitor. A conductive plate, which we call the return electrode, is connected to this side of the output circuit, which must be in good contact with the patient with its large surface. This plate is in the chassis in terms of high frequency. As it can be understood, the electrocautery current coming out of the active electrode completes its circuit from this plate. Therefore, if the active electrode is worth it, it can complete its circuit and cause injurious results on other people around, due to the capacitive connection to the ground.



Electrocautery Application Areas

Cutting: Depending on the current applied to the patient without interruption and modulation, the tissue cells are heated. When this heating temperature suddenly rises above 100 degrees, the cell water suddenly evaporates, breaking the cell wall and creating a shear effect.

Coagulation: For this application, the current density is reduced by pulse modulation with the use of large contact electrodes. As a result, the temperature of the cell is below 100 degrees, and instead of bursting the walls, it is slowly ejected out of the cell. Since the cell plasma also loses its water, it shrinks and the desired coagulation effect occurs. Although the device outputs different characteristics as cutting and coagulation current, dangerous burns may occur if the necessary attention is not paid to points such as electrode type and dose.

Involved two cutting: In parallel with the cutting process, bleeding control, that is, the effect of hemostasis, is provided by placing the device in the “BLEND” position and adjusting the dose related to cutting, if desired. Some pulse modulation is added to the cutting current for this process.

Bipolar coagulation: Outputs of this type are available on a stand-alone device or in addition to the UNIPOLAR output. This output is different for reasons such as the type of electrode used and not using a return electrode. It is used for coagulation of sensitive and easily damaged tissues.

The Electrosurgery Analyzer is a medical device used to test and analyze the performance of electrosurgical instruments and systems. Electrosurgery is a surgical technique that uses high-frequency electrical current to cut, coagulate, or ablate tissue during surgical procedures. The Electrosurgery Analyzer helps ensure the safety and efficacy of these instruments by providing various measurements and tests. The analyzer typically consists of a control unit and a set of specialized probes and cables. It can evaluate key parameters such as power output, current leakage, waveform quality, and impedance. By measuring these parameters, the analyzer can determine if the electrosurgical instrument is functioning properly and within safe limits. During the analysis, the electrosurgical instrument is connected to the analyzer, and specific tests are performed. For example, the analyzer may simulate various tissue types and impedance levels to assess how the instrument responds under different conditions. It can also measure the insulation integrity of electrosurgical accessories to prevent potential electrical hazards. The Electrosurgery Analyzer plays a crucial role in maintaining the quality and safety of electrosurgical procedures. It helps healthcare professionals identify any performance issues or malfunctions in the electrosurgical instruments, ensuring that they provide accurate and reliable results during surgeries. Furthermore, regular testing with the analyzer helps comply with regulatory standards and guidelines, promoting patient safety and reducing the risk of complications. In summary, the Electrosurgery Analyzer is a specialized medical device used to test and evaluate the performance of electrosurgical instruments. It helps ensure their safety, efficacy, and compliance with regulatory standards, ultimately contributing to the success of surgical procedures and patient well-being.

REFERENCES

1. IEC 601-2-2-91 “Medical electrical equipment.”,
2. IEC 60601-1 “ Medical electrical equipment. General requirements for basic safety and essential performance”.