Electrosurgery

marClamp®

BIPOLAR VESSEL SEALING SYSTEM – EASY TO USE, RELIABLE AND COST-EFFICIENT

WORKING PRINCIPLE AND TECHNICAL BASICS

KLS martin GROUP

The marClamp® bipolar vessel sealing system – easy to use, reliable and cost-efficient

marClamp®

The marClamp® vessel sealing system enables the surgeon to seal (occlude) major vessels and tissue bundles permanently and reliably using the bipolar technique. The system is mainly intended for use in gynecology, urology and general surgery. It includes specially designed marClamp® instruments that must be used in conjunction with the special SealSafe current offered by Martin's new maxium® HF generator.

The SealSafe current

The SealSafe current is a unique HF current, specially developed for vessel sealing with marClamp® instruments. Its hallmark is the very high power-to-voltage ratio (high output power but low voltage), compared with the traditional bipolar HF technique. But there is another factor that comes into play, namely the high pressure with which this special current is applied to the tissue via the instrument's jaws. It is this special interaction that reliably transforms endogenous structural proteins (such as collagen and elastin) to create a permanently sealed zone. The point is, however, that only the tissue grasped between the instrument's jaws is actually sealed. Lateral thermal tissue damage can thus be kept at an absolute minimum.

Moreover, the maxium® generator provides continuous tissue impedance monitoring for increased safety and precision. In this sealing process, individual "energy packages" are sequentially emitted into the tissue in the form of high-frequency pulses until the desired degree of sealing is achieved. Completion of this process is confirmed by an acoustic signal. At the same time, the maxium® HF generator automatically stops power output, thus preventing tissue carbonization.

The marClamp® vessel sealing system spares you time-consuming ligatures with suture material. There is, however, another important advantage because no foreign material needs to remain in the patient's body. And last but not least, the system spares you the costs of consumables because marClamp® instruments are completely reusable.

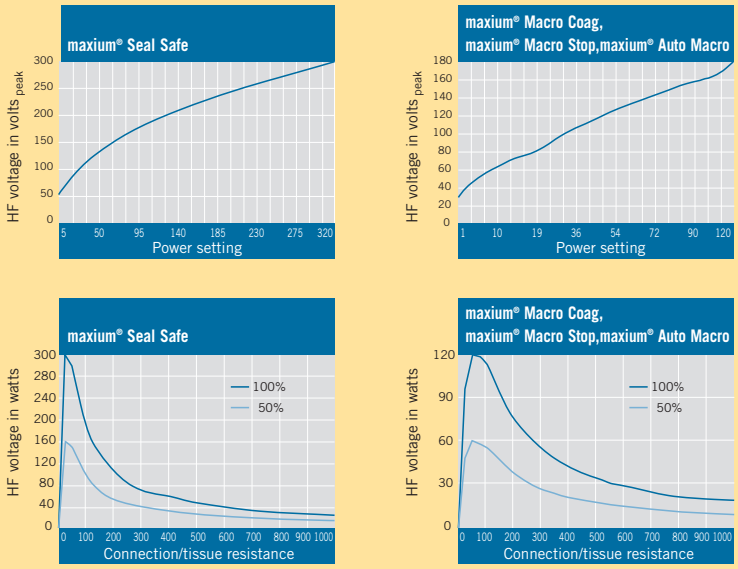
The Macro Coag current

A look at the market shows that some manufacturers of HF systems tend to declare standard currents for bipolar coagulation as "suitable for vessel sealing" as well.
However, the Macro Coag current frequently mentioned in this context is actually a standard forceps current for use in open surgery and laparoscopy, specially adapted to standard bipolar forceps or similar instruments and generally used only for coagulating minor vessels. This type of current is available with most conventional HF generators (including the ones offered by KLS Martin), but it differs substantially from our SealSafe current in terms of performance parameters and technical characteristics. Needless to say, Martin's advanced maxium® HF surgical unit offers you both types of current.

The crucial point is that vessel and tissue sealing – as shown in the illustrations below – is not possible with conventional bipolar coagulation currents. Therefore, the SealSafe sealing current is mandatory for these purposes when using our maxium® HF unit.

Due to the high mechanical pressure applied to the tissue through the jaws of the marClamp® instrument, and the relatively large tissue volume held between the jaws, the tissue's input resistance (or load impedance) is a lot lower

Technical comparison between the two bipolar high-frequency currents



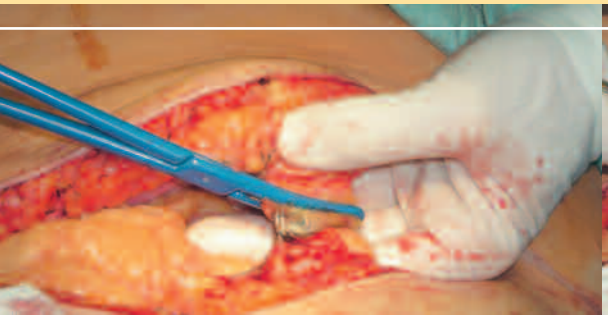


Fig. 1: SealSafe current being applied with a marClamp® instrument for vessel sealing during a gastrectomy. The example above shows two parallel sealing actions performed on a tissue bundle. As can be seen, the sealing process changes the nature of the tissue, which typically takes on a parchment-like appearance.

Fig. 2: The sealed tissue bundle shown in Fig. 1 is simply cut off with a pair of surgical scissors, without any need for additional ligatures or clips.

Fig. 3: A typical setting selected on the maxium® HF generator for the sealing procedure illustrated on the left (Fig. 1).

than in conventional forceps coagulation. This requires a generator capable of providing high power intensities to ensure that enough energy (as required for vessel sealing) is supplied to the tissue. Conventional bipolar generators cannot provide such high-power currents. A comparison between the technical parameters of a typical coagulation current and the SealSafe current will show you the difference (see above diagram).

With the SealSafe current, the maximum output voltage is limited to values that reliably prevent spark formation and thus tissue carbonization.

In SealSafe mode, the maxium® generator can provide a power output of up to approx. 320 watts at a tissue resistance of just 25 Ω. Even lower resistance values typical for vessel sealing – say, 10 Ω – still enable out-puts in the range of 200 W.

In the Macro Coag mode, in contrast, the generator can only provide an output power of approx. 30 watts under the same resistance condition. Consequently, tissue sealing would not be feasible. Why? Because, in the first place, it would require extremely long application times if you tried to use such low power outputs for heating up large tissue volumes (as shown in Fig. 1) sufficiently for sealing. Besides, it is altogether doubtful whether the intended (thermally induced) tissue change can be achieved with such a current, taking into account the energy loss (or dissipation) due to tissue perfusion.

However, there is still another reason: The intended "parchment-like" sealing quality (see Fig. 1) can only be attained if the high-frequency energy is released into the tissue intermittently – i.e. not continuously, but by repeated energy pulses, just as in the SealSafe mode. Moreover, SealSafe provides automatic control in terms of impedance-dependent – and thus sealing degree-dependent – release of the energy pulses. This time-controlled process ensures that power is applied only until the sealing degree selected by the user has been achieved. Since conventional coagulation currents, in contrast, release the electric energy continuously into the tissue, they are unsuitable for sealing purposes.

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