DE NOVO CLASSIFICATION REQUEST FOR remOVE SYSTEM

REGULATORY INFORMATION

FDA identifies this generic type of device as:

> **Endoscopic electrosurgical clip cutting system.** An endoscopic electrosurgical clip cutting system is a prescription device that applies electrical energy to fragment metallic clips, which are devices placed in the digestive tract to close gastrointestinal perforations, hemorrhages, or perform resection. The system includes instruments that are then used to remove the fragmented clips from the digestive tract.

NEW REGULATION NUMBER: 21 CFR 876.4310

CLASSIFICATION: II

PRODUCT CODE: QAG

BACKGROUND

DEVICE NAME: remOVE System

SUBMISSION NUMBER: DEN160014

DATE OF DE NOVO: April 11, 2016

SPONSOR: Ovesco Endoscopy AG
Dorfackerstrasse 26
Tuebingen, Baden-Wuerttemberg
Germany

INDICATIONS FOR USE

The remOVE System consists of the DC Impulse and the DC Cutter Set.

The remOVE DC Impulse is a medical electrical device for fragmentation of OTSC® (endoscopic device for effective treatment of hemorrhage and acute or chronic wall defects in the GI tract) and FTRD® (endoscopic device for full-thickness resection of colorectal wall lesions) clips made by Ovesco Endoscopy AG for the digestive tract.

The remOVE DC Cutter Set is a set of instruments for use in flexible endoscopy. It consists of a bipolar DC instrument for the fragmentation of OTSC (endoscopic device for effective treatment of hemorrhage and acute or chronic wall defects in the GI tract) and FTRD (endoscopic device for full-thickness resection of colorectal wall lesion) clips from Ovesco Endoscopy AG, a pair of forceps and a cap for removal of these fragmented clips.

LIMITATIONS

For prescription use only.

The remOVE System should not be used if the edges of clip for cutting are not visible.

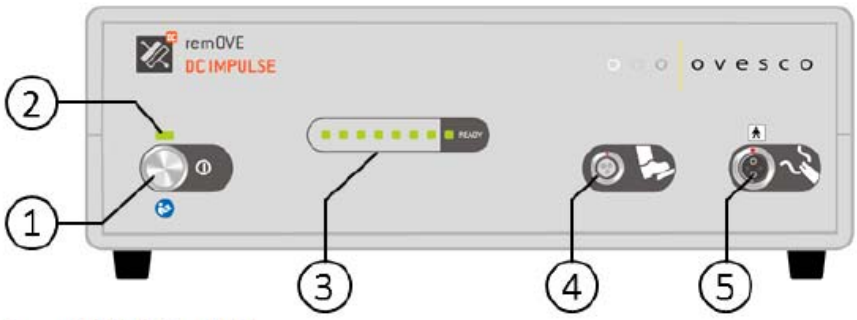
The remOVE System is contraindicated if the clinical effect of the clip is still necessary.

PLEASE REFER TO THE LABELING FOR A MORE COMPLETE LIST OF WARNINGS, PRECAUTIONS AND CONTRAINDICATIONS.

DEVICE DESCRIPTION

The remOVE System is comprised of the DC Impulse generator and the DC Cutter Set for the fragmentation and removal of OTSC ("over the scope clip" cleared under K101428) and FTRD ("full thickness resection device" cleared under K153550) clips from the digestive tract.

DC Impulse:



1 ON/OFF switch
2 ON/OFF display
3 Status display: charge of battery / ready for use / error
4 Connection foot-activated switch
5 Connection DC cord

Figure A: DC Impulse electrical generator.

The DC Impulse is an electrical generator that produces pulsed, direct current (DC) to cut OTSC and FTRD clips. The DC Impulse generator is equipped with internal energy storage, allowing the device to generate pulsed DC without additional load on the power supply. The internal energy storage is charged before delivering the pulsed DC. DC Impulse is designed specifically for use with the DC Cutter and cannot be used with other instruments. Components required for operating the DC Impulse generator are a foot switch, a DC cord for connection to the DC Cutter instrument, and a power cord. The DC Impulse and accessories are reusable.

DC Cutter Set:

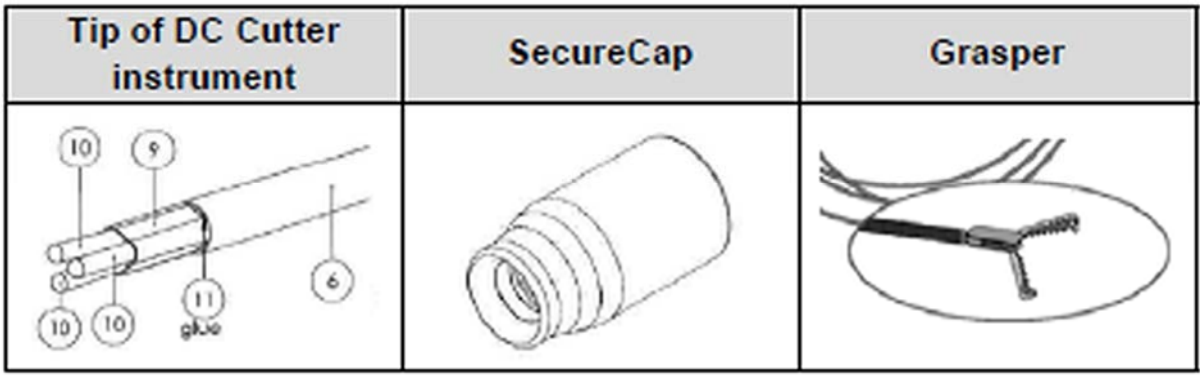


Figure B: DC Cutter Set components including DC Cutter, SecureCap, and Grasper.

The DC Cutter Set includes three components: DC Cutter instrument, SecureCap retrieval cap, and Grasper. The DC Cutter is a bipolar, direct current instrument for flexible endoscopy and is meant for use only with the DC Impulse generator and flexible endoscopes with a working channel diameter of 2.8 mm. It is connected to the DC Impulse generator via the DC cord. The Grasper is used to retrieve the clip fragments. The dimensions of the Grasper are 2200 mm in length and 2.3 mm in diameter. The set is provided sterile and intended for single use only.

Table 1: remOVE System operational characteristics.

Specifications	
Instrument type remOVE DC Cutter	Bipolar / direct current
One-time duration of impulse during activation	≤ 65 ms
Output current remOVE DC Cutter	155 A (≤ 165 A max)
Output voltage remOVE DC Cutter	1.3 – 2.0 V
Interval between activations	≥ 6 s

Mode of Operation:

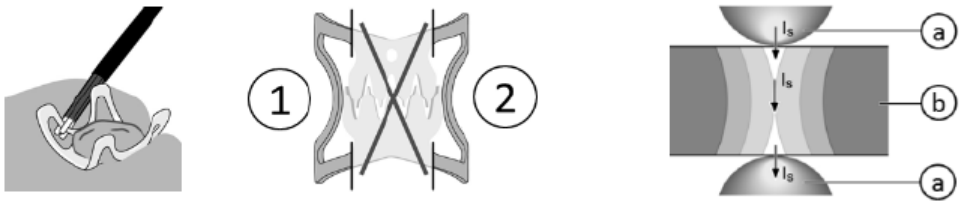


Figure C: Steps of the remOVE System during use.

The figures above on the left and center show the device operation, specifically how the Cutter instrument is placed at the clip and positions suitable for clip fragmentation (1 and 2). The figure on the right shows a cross-section of the clip segment to be cut and the current path (Is) between the electrodes.

The DC Impulse sends a pulse of direct current for duration of 60 ms through the bipolar, endoscopic DC Cutter instrument. A DC pulse delivers 155 A (b) (4) and (b) (4) between the electrodes to fragment the clips.

After successfully fragmenting a clip (e.g., separating the clip at the two opposite locations), the DC Cutter is removed from the endoscope. The SecureCap retrieval cap is then attached on the tip of the endoscope and the Grasper is inserted to retrieve the clip fragments from the patient.

SUMMARY OF NONCLINICAL/BENCH STUDIES

BIOCOMPATIBILITY/MATERIALS

The DC Impulse does not contact the patient during use. The DC Cutter Set has the only patient-contacting components of the remOVE System. The DC Cutter Set is an external communicating device with limited contact (b) (4) and was tested for cytotoxicity, sensitization, and intracutaneous irritation testing as per ISO 10993-1, Biological evaluation of medical devices –Part 1: Evaluation and testing within a risk management process. All results demonstrated an acceptable biocompatibility profile.

Table 2: DC Cutter Set Patient-Contacting Materials

Component	Material / Trademark
Cutter	(b) (4)
Instrument tip	
Silicone coating	
Silicone glue	
Shrink tubing	
Instrument shaft coat	
SecureCap retrieval cap	
SecureCap retrieval cap	
Grasper	
Grasper tip	
Grasper sheath	

SHELF LIFE/STERILITY

Cleaning instructions of the remOVE System components that are provided non-sterile are included in the labeling. The DC Cutter Set of the remOVE System is provided sterile and intended for single use only. Ethylene Oxide (EO) sterilization validation was conducted on the DC Cutter Set via the overkill approach at a sterility assurance level (SAL) of 10^{-6} in accordance with ISO 11135-1:2007, Sterilization of health care products – Ethylene oxide – Requirements for development, validation and routine control of a sterilization process for medical devices.

The shelf-life of the DC Cutter Set is labeled for 1 year based on accelerated aging testing

equivalent to 1 year in accordance with ASTM F1980-07:2001, Standard guide for accelerated aging of sterile barrier systems for medical devices. Following aging, the devices were inspected for packaging integrity for seal strength, visual, and dye penetration testing. Aged devices also underwent functional bench testing to confirm acceptable performance, as described in the section titled Performance Testing – Bench.

ELECTROMAGNETIC COMPATIBILITY AND ELECTRICAL SAFETY

The remOVE System was tested for electromagnetic compatibility as per the requirements of IEC 60601-1-2:2007 (Third Edition), Medical electrical equipment part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic compatibility – Requirements and tests. Test results demonstrated that the remOVE System is compliant to the requirements of this standard.

The remOVE System was tested for electrical and thermal safety as per the requirements of IEC 60601-1:2005 + Corr. 1 (2006) + Corr. 2 (2007) + AM1 (2012) or IEC 60601-1:2012, Medical electrical equipment Part 1: General requirements for basic safety and essential performance. Thermal safety of the device was also evaluated by a risk management process for temperatures and clinical effects to address the applied parts that are intended to supply electrical energy.

Electrophysiological safety of the device was tested to ensure that the high frequency currents from the device do not cause unintended, adverse cardiac effects. This testing was performed to evaluate neuromuscular stimulation, as a risk of applying high frequency direct current. The results from this testing were evaluated to demonstrate that the device application for current and current density specifications of the remOVE System is below the threshold that would illicit adverse effects.

PERFORMANCE TESTING – BENCH

Non-clinical performance bench testing was done with the remOVE System following natural aging and sterilization. Testing was conducted to evaluate functional performance for design verification and validation of the device.

Usability:
Usability testing with the remOVE System was conducted per IEC 62366:2007 (First Edition) + A1:2014, Medical Devices – Application of usability engineering to medical devices. Usability testing evaluated the functional and operational aspects of the device to support its safe and effective use. Key elements evaluated include operability of device over individual procedural steps, field of view, and comprehensibility of labeling materials.

Stress:
The DC Impulse generator and components underwent stress testing by repeatedly simulating the pulse mode (165 A max over 75 ms) that it would be subject to over its lifespan. The device and components passed all test cycles and there was no

deterioration of the equipment caused by the energy flows.

Additional functional testing on the remOVE System was performed as part of the animal studies.

PERFORMANCE TESTING – ANIMAL &/OR CADAVER

Tissue Models:
Tension and compression tests were performed on the SecureCap accessory of the DC Cutter Set to determine the force required to place and remove the SecureCap on an endoscope during a procedure and this testing showed that there were no negative impacts on the SecureCap. Also, the SecureCap was tested to show that its functional capabilities are upheld when the Grasper component of the DC Cutter Set is used and the clip fragment is pulled into the cap and withdrawn using the endoscope. These tests used models of the upper and lower gastrointestinal tracts fitted with porcine tissue organs.

Animal Studies:
In vivo and *ex vivo* animal testing was performed with the remOVE System in esophagus, gastric wall, duodenum, and colon to evaluate safety and effectiveness of the device application to remove the gastrointestinal clip. Also, the animal studies evaluated thermal collateral tissue damage as a risk of the device procedure. The Grasper and SecureCap were also tested in the animal study to evaluate the functionality of the components during application. The results of the animal studies support the safe and effective use of the device.

SUMMARY OF CLINICAL INFORMATION

Clinical experience with the remOVE System includes the compassionate use of the device on 11 patients in Europe. Complete retrieval of all clip fragments was possible in 10 patients. In one patient, a firmly ingrown piece of the clip was left in place, which was without further consequences. All bleeding was treatable with common hemostatic endoscopic techniques. Three-channel electrocardiogram monitoring during the procedure did not show any changes in heart rhythm. Also, a retrospective study was conducted on the compassionate use of the device in a total of 74 patients treated with the remOVE System (including the 11 above). Clip removal was successful in 72 patients. In the two remaining cases, clip removal was not possible, because the clip was completely epithelialized. In 9 of the 74 patients, a clip fragment remained in the intestinal wall because it was deeply incorporated and could not be removed. No serious complications were observed. In two patients, minor bleeding was discovered near the clip removal site and was conventionally treated with epinephrine injections. In one patient, a superficial mucosal tear was found at the clip removal site of the stomach and was closed endoscopically with endo-clips. Sixty three (63) of the 74 patients had complete clip removal. Overall, the information on the 74 cases support the safety and effectiveness of the remOVE System for its intended use.

Additionally, the remOVE System has been the subject of several compassionate use requests that were approved for use in the United States. Follow-up reports indicate that the procedures were performed successfully with no serious complications.

Pediatric Extrapolation

In this De Novo request, existing clinical information was not leveraged to support the use of the device in a pediatric patient population.

LABELING

The remOVE System complies with the labeling requirements for prescription devices under 21 CFR 801 and the special controls for this device type. The device labeling includes the DC Impulse Instructions for Use, the DC Cutter Set Instructions for Use, the remOVE System brochure, and package labels. (b) (4) -The DC Cutter Set labeling includes a shelf life as it is a single use device. The labeling materials include relevant information on the proper use and function of the device, its intended use, contraindications, and appropriate warnings and precautions for its safe and effective use during its shelf-life.

RISKS TO HEALTH

The table below identifies the risks to health that may be associated with use of the endoscopic electrosurgical clip cutting system and the measures necessary to mitigate these risks.

Table 3: Identified Risks to Health and Mitigation Measures

Identified Risks to Health	Mitigation Measures
Unintended tissue damage (burns, perforations, bleeding)	Animal performance testing Non-clinical performance testing Electrical and thermal safety testing Usability testing Labeling
Electromagnetic interference / Electrical shock	Electromagnetic compatibility testing Electrical safety testing Labeling
Adverse tissue reaction	Biocompatibility evaluation
Infection	Sterilization validation Shelf life testing Labeling

SPECIAL CONTROLS:

In combination with the general controls of the FD&C Act, the endoscopic electrosurgical clip cutting system is subject to the following special controls:

1. Non-clinical performance testing must demonstrate that the device performs as intended under anticipated conditions of use. The following performance characteristics must be tested:
    a. Performance bench testing to evaluate the functionality (including stress, compatibility, usability, and reliability) of the device during use.
    b. Electrical and thermal safety testing
    c. Electromagnetic compatibility testing
2. Animal testing must evaluate tissue damage, including thermal effects, during the clip removal procedure. This testing should also evaluate usability and effectiveness of the device.
3. The patient-contacting components of the device must be demonstrated to be biocompatible.
4. Performance data must demonstrate the sterility of the device components intended to be provided sterile.
5. Performance data must support shelf life by demonstrating continued sterility of the device (or the sterile components), package integrity, and device functionality over the labeled shelf life.
6. Labeling of the device must include:
    a. Instructions for use.
    b. A shelf life for single use components.

BENEFIT/RISK DETERMINATION

The risks of the device are based on nonclinical laboratory and animal studies as well as data collected in the clinical experiences described above. Probable risks with the use of the device include: unintended tissue damage (thermal or electrical effects to the digestive tract, hemorrhages, perforations, infections). The probability of such harmful events is low and occurrence can be managed.

The probable benefits of the device are also based on nonclinical laboratory and animal studies as well as data collected in the clinical experiences described above.

Following are probable benefits:

- Safe and effective removal of OTSC and FTRD clips.
- Currently, there is no method or device available for this procedure.

Patient Perspectives

This submission did not include specific information on patient perspectives for this device.

Benefit/Risk Conclusion

In conclusion, given the available information above, the data support that for the removal of metallic clips from the digestive tract, the probable benefits outweigh the probable risks for the remOVE System. The device provides benefits and the probable risks can be mitigated by the use of general controls and the identified special controls.

CONCLUSION

The De Novo request for the remOVE System is granted and the device is classified under the following:

Product Code: QAG
Device Type: Endoscopic electrosurgical clip cutting system
Class: II
Regulation: 21 CFR 876.4310