NEW PROPERTIES
NEW OPPORTUNITIES FOR TREATMENT

MUL Surgeon

three-wave surgical laser system
Multi-purpose three-wave laser system

The laser beam – is an up-to-date medical device with special features, which in many cases lead to unique positive results of treatment. These are – significant reduction in the duration of surgical operations, minimization of surgical traumas to the patient, reduction of the rehabilitation period, minimization of postoperative relapses.

Multi-wave surgical laser devices are state of the art medical equipment which because of its technical characteristics, is versatile and has broad functional capabilities.

Universal three-wave surgical laser system

System MUL Surgeon (MUL) can be used in the following fields of medicine: urology, gastroenterology, dermatology, gynecology, otorhinolaryngology, bronchoscopy, neurosurgery, general surgery, plastic surgery, orthopedics, cosmetology and others.

The main purpose of MUL is to act on surface, near-surface or internal tissues of human body (including cartilage and bone) in the course of the following basic operational actions: dissection, excision, perforation, coagulation; bloodless dissection and excision; evaporation; lithotripsy of solid concrements; arrest of capillary and venous bleeding, intravenous coagulation of venous vessels; endoscopic arrest of ulcerous bleeding in gastrointestinal tract; volume coagulation of tumor and others strictures.

The MUL system possesses a unique (not having direct analogues in the world) laser technology, enabling operation at three different wavelengths generated by a single generator and transmitted to the operational zone along a single thin, flexible and durable fiber.

The basic working element of the system is Nd: YAG-laser operating at wavelengths of 1.06, 1.32 and 1.44 microns in pulse-frequency mode from a single generator. The radiation is transported to the operation area through a flexible fiber. The design of the optical fiber provides for its rapid replacement by an optical fiber of another diameter. This enables medical personnel to work with any kinds of endoscopic equipment. Average output reaches 100, 60 and 25W respectively. The peak pulse power in some modes can reach 20 kW.

A wide range of adjustable output power allows employing the MUL system for: effective volume coagulation, reliable hemostasis (at a wavelength of 1.06 µm); dissection of tissue with simultaneous coagulation effect (1.32 µm); dissection of tissue with narrow width of incision and small necrosis area (1.44 µm); tissue vaporization mode in aquatic environment without carbonization and smoke.

When necessary, the MUL system can work as an efficient two-channel lithotripter (with the wavelengths of 1.32 and 1.44 µm), capable of crushing concrements of different structure and hardness.

The pulse operating mode has a local and controlled impact on tissue. It allows reaching coagulation effect identical with the effect of the continuous radiation but with a lesser radiation dose and minimal damage to the healthy tissue. The pulse operating mode’s advantages are evident in plastic surgery and cosmetology when removing different neoplasm on tissue surface and cheloid scars. The pulse mode virtually eliminates dirtying and damage to the fiber due to its efficient self-cleaning.
Operation of the system in the pulse mode when the fiber is applied either externally or internally excludes flame at the distal end of the fiber.

Bright laser pointers of red and green colors allow reliable observation of the location of the fiber tool. The red pointer is traceable inside human tissue up to 40 mm from the surface and the green one is applied for the external use. The brightness control is provided for both laser pointers.

The main elements of the system are developed by the Tetraedr UE and made in accordance with the EU standards.

The system has a built-in computer multimedia control system, which has the following features:
- programming and displaying of operation modes of the device is carried out on a color display with touch controls;
- interactive learning mode for users;
- self-diagnostic system;
- voice messages and audio signals about operation of the system;
- password-protected system for doctor’s recognition and access registration;
- saving of working parameters;
- journaling of surgical operations;
- doctor’s operational menu;
- network connection capability: network of clinic, Internet.

The touch screen control board can be moved out, turned left and right for the convenience of the operator.

The computer control provides automatic control of the system operation and minimizes actions of the operator.

The laser channels can be switched over and turned off easily by surgeons during operations within one second by means of a two-button pedal.

Low weight (up to 120 kg) and dimensions (620x880x1170 mm) of the multifunction laser system allow, when necessary, moving it easily from one room to another.

The MUL system is delivered with medical fiber tooling (quartz optical fibers for laser beam), length – up to 7m. The tooling is available in various diameters, lengths and types of tips. This allows laser employment for external and internal medical operations with the use of any endoscopic instruments.

Fiber tools are designed for long-term use (up to 1000 operations) and allow multiple sterilization, including gas and gas-plasma methods.

The following sets of equipment can be supplied optionally:
- sets of additional medical equipment for vascular, endoscopic and urologic operations - ultrasound scanner, holedohoskop, cystoscope;
- set of special medical instruments for laser surgery for laparoscopic operations.
- set of special medical instruments for laser surgery for open operations.
- set of special medical instruments for laser surgery for vascular operations.

### Laser channel No.

<table>
<thead>
<tr>
<th>Laser channel No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary features</td>
<td>Coagulation</td>
<td>Dissection with coagulation, Soft Lithotripsy</td>
<td>Dissection, Hard Lithotripsy</td>
</tr>
<tr>
<td>Wavelength, µm</td>
<td>1,06</td>
<td>1,32</td>
<td>1,44</td>
</tr>
<tr>
<td>Mean output radiation power, W</td>
<td>100</td>
<td>60</td>
<td>25</td>
</tr>
<tr>
<td>Output radiant pulse energy, J</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Radiant pulse frequency, Hz, up to</td>
<td>100</td>
<td>75</td>
<td>50</td>
</tr>
</tbody>
</table>