RevoLix™

Thulium Laser
RevoLix™ – why ?

RevoLix™ is the only laser specifically developed for soft tissue surgery. The RevoLix™ laser wavelength is 2 micron. This wavelength is similar to Holmium but the emission is continuous instead of pulsed. RevoLix™ unifies the advantages of formerly existing surgical laser principles in a single unit:

- RevoLix™ laser beam is delivered by flexible laser fibres. Incision and vaporization of tissue is similar to CO2 laser technology. This is ideal for endoscopic, laparoscopic, open and minimally invasive surgery.
- RevoLix™ excellent haemostasis is proven for the treatment of high risk BPH patients under anticoagulant medication [9].
- RevoLix™ provides the highest tissue vaporization rate published. Unlike green lasers the RevoLix™ vaporization efficiency does not decrease during surgery because the absorbing chromophore is water [10]. RevoLix™ tissue effect is shallow. Incisions are smooth and clean.

RevoLix™ – what are the advantages ?

Cutting efficiency of soft tissue and haemostasis is superior to any known alternative. Saline or water is used for irrigation reducing the risk of TUR syndrome [2].

Excess laser radiation is absorbed by the irrigation and does not affect tissue more than 3 mm from the tip of the fibre tip. Tissue damage is limited to 0.2 to 1.0 mm.

Visualization is excellent. Neither bleeding nor visible laser glare affects the vision of the surgical site. Colour neutral laser safety glasses maintain true colours. Endoscope lenses remain free from splatter when used in laparoscopic surgery.

RevoLix™ – what are the benefits ?

- No blood loss, no transfusions
- Quick recovery
- Short hospital stay
- Less postoperative care
- Short catheterization time in BPH treatment
- Precise surgery
- No deep tissue penetration
- Safe operation
- Excellent haemostasis
- Treatment of patients under anticoagulant
- Ejaculation protective BPH surgery
- Multi-disciplinary

RevoLix™ – why 2 micron continuous wave ?

The RevoLix™ wavelength at 2.0 micron is excellent for incision and vaporization. It is safe in an aqueous irrigation and it provides superior haemostasis. The effect of the laser on tissue is independent of tissue vascularization.

These outstanding properties are due to the efficient absorption at the RevoLix™ wavelength of 2.0 micron by the water molecule which is ubiquitous in any tissue. Strong absorption and continuous wave emission provides precise cutting and vaporization of soft tissue with excellent haemostasis. There is no deep penetration or uncontrolled necrosis. Clean cuts and excellent haemostasis are achieved by moving the fibre across the surgical site.

Absorption spectra of body chromophores

This graph shows the absorption of the most important body chromophores (RED for blood, BLUE for water, BROWN for melanin) at different wavelengths. Depth of penetration is shown at the right. Laser wavelengths are shown as vertical lines.

Green laser: In the absence of haemoglobin the Green laser at 532 nm experiences close to no absorption in tissue because at this wavelength water is almost transparent. Under laser treatment haemoglobin bleaches due to the temperature increase in tissue caused by the laser. This explains the ever decreasing vaporization efficiency during a Green laser treatment.

Diode laser: At Diode laser wavelength neither water nor haemoglobin is a good absorber. This explains the deep penetration of diode lasers and the Nd:YAG laser.

RevoLix™ and Holmium laser: Both lasers are of similar wavelength which is selectively absorbed by the water molecule. The optical penetration of RevoLix™ in tissue is app. 0.25 mm [13].

Unlike haemoglobin water retains its absorptive properties when heated by any laser. This explains the everlasting tissue effect during RevoLix™ treatment.
RevoLix – why is it safe?

In an aqueous irrigation the laser effect to tissue is restricted to less than 3 mm in front of the tip of the fibre. Any tissue further afield is shielded by the irrigant. The same mechanism is protecting tissue and organs adjacent to the cut. Any tissue more than 3 mm distant is unaffected by the RevoLix laser. Unlike green lasers this eliminates the risk of unintentional tissue damage during laser surgery. Penetration and tissue damage is almost independent of power and is the same for all RevoLix lasers.

RevoLix – BPH protocols and learning curve

RevoLix offers a variety of BPH options [8]:

- ThuVAP
- ThuVaRP
- ThuVEP + ThuLEP

Your learning curve benefits from the range of these protocols. The beginner will start with vaporization and later will progress cutting chips which increase in size and finally ending up in enucleation – all with the same instrument.

Throughout the learning curve there is no additional surgical risk. For the RevoLix novice only the OR time is longer at the beginning of the learning curve [12].

Tissue samples are produced for subsequent histological examination during Vaporesection and Enucleation. RevoLix for BPH surgery is efficient and safe [6, 15].

RevoLix – suitable for large glands and how long does surgery take?

For RevoLix there is no limitation in prostate size. Gland volumes of up to 200 ml (TRUS) are reported. Approximately 1.5 grams per minute of tissue are enucleated [14, 15].

RevoLix DUO – one box for BPH and stones

RevoLix DUO is the first universal laser in urology for lithotripsy, BPH, bladder tumours, UTUC, open and laparoscopic surgery. This versatility is achieved by combining a pulsed Holmium-YAG laser and a continuous wave Thulium-YAG laser in a single box. Lithotripsy in the lower, medial and upper tract with rigid and flexible instruments is accomplished by the integrated Holmium laser. Stones are fragmented irrespective of the chemical composition. Highly flexible laser fibres are most suitable for URS of the lower calix with flexible instruments.

Both laser units of the RevoLix DUO are available from the same fibre port. This feature allows using the same laser fibre for soft tissue surgery and for lithotripsy.

How do RevoLix lasers match with your theatre?

RevoLix is extremely user friendly. In the theatre the RevoLix laser operates quietly. Large castors allow for easy movement between rooms. RevoLix lasers operate from a standard power outlet. No special installation is required. The laser has proven its extreme sturdiness during routine transportation between theatres and use by mobile healthcare services.
Family of Kix footswitches

To activate the laser device the choice of two footswitches is available. The Kix footswitch has a single pedal. The Kix DUO double pedal footswitch makes 2 selectable power settings available at the tip of your toe. This optional feature allows switching between power settings for cutting and coagulation or between different settings for slow and fast cutting speeds.

RevoLix – delivery systems perfected

LISA offers a wide range of specialised delivery systems. Reusable front firing fibres are stripped and cleaved in preparation for the next case. Disposable laser fibres are used in theatre situations where reuse is not allowed. Please refer to the LISA Surgical Laser Accessories brochure for laser applicators and reconditioning tools and to the Surgical Laser Fibres brochure for various front and side firing fibres.

RevoLix – applications and publications

The RevoLix laser system has demonstrated its superiority in surgical disciplines such as urology, neurosurgery*, ENT, gynaecology and bronchoscopy. More than 150 articles are published about surgical applications with LISA RevoLix lasers.

Literature on RevoLix lasers:

7) S2e Leitlinie “Therapie des Benignen Prostatasyndroms (BPS)”, 2014, DGU, AK BPS
RevoLix – what are the applications?

The RevoLix laser system has demonstrated its superiority in surgical disciplines such as Urology, Neurosurgery*, Gynaecology, Pneumology and ENT. In Urology RevoLix gains much attention for its superior performance in vaporization and resection of the prostatic adenoma (BPH), outpatient treatment of reoccurring renal UTUC and bladder tumours, opening of strictures, incisions and tissue preserving excisions.

**Urology**
- VapoResection of prostate (ThuVaRP)
- Vaporization of prostate (ThuVAP)
- VapoEnucleation of prostate (ThuVEP)
- Blunt enucleation of prostate (ThuLEP)
- Bladder neck incision
- Opening of strictures
- Vaporization and excision of bladder tumours
- Vaporization of upper track urothelial carcinomas UTUC
- Partial nephrectomy
- Laparoscopy

**Lithotripsy**

**Gynaecology**
- Hysteroscopy
- Endometriosis
- Adhesiolysis
- Conisation
- Condylomata

**Neurosurgery***
- Fenestration of cysts
- Ventriculocysternosomy
- Catheter recovery
- 3rd ventriculostomy
- Tumour resection
- Haemostasis

**ENT**
- Excision of tumours
- Tonsillectomy
- Conchotomy

**Pneumology**
- Bronchoscopy
- Airway recanalization
- Desobstruction
- Tissue coagulation
## Technical Specifications

### 120 Watt Laser

- **Tissue laser system**: continuous wave DPSS laser
- **Wavelength**: 2013 nm
- **Power at fibre tip**: 5 to 120 W (adjustable)
- **Emission mode**: continuous wave, chopped 50 ms - 1000 ms
- **Repetition rate (chopped mode)**: 0.5 - 10 Hz
- **Beam delivery**: wide range of flexible silica fibres
- **Fibre identification**: optical
- **Aiming beam**: 635 nm (red) or 532 nm (green), max. 1 mW (adjustable)
- **Mains supply**: 208 - 240 V AC, 50/60 Hz, (1~, N, PE), max. 16 A
- **Cooling system**: integrated cooling
- **Dimensions**: H 1025 x W 420 x L 1007 mm (height w/o display)
- **Weight**: 170 kg
- **Environmental conditions**: 15 - 28 °C / 10 - 90 % humidity (non-condensing)

### 200 Watt Laser

- **Tissue laser system**: continuous wave DPSS laser
- **Wavelength**: 2013 nm
- **Power at fibre tip**: 5 to 200 W (adjustable)
- **Emission mode**: continuous wave, chopped 50 ms - 1000 ms
- **Repetition rate (chopped mode)**: 0.5 - 10 Hz
- **Beam delivery**: wide range of flexible silica fibres
- **Fibre identification**: optical
- **Aiming beam**: 635 nm (red) or 532 nm (green), max. 1 mW (adjustable)
- **Mains supply**: 208 - 240 V AC, 50/60 Hz, (1~, N, PE), max. 16 A
- **Cooling system**: integrated cooling
- **Dimensions**: H 1025 x W 420 x L 1007 mm (height w/o display)
- **Weight**: 170 kg
- **Environmental conditions**: 15 - 28 °C / 10 - 90 % humidity (non-condensing)

### 150/20 Watt Laser

- **Tissue laser system**: continuous wave DPSS laser
- **Wavelength**: 2013 nm
- **Power at fibre tip**: 5 - 150 W (adjustable)
- **Emission mode**: continuous wave, chopped 50 ms - 1000 ms
- **Repetition rate (chopped mode)**: 0.5 - 10 Hz
- **Stone laser system**: pulsed Holmium-YAG laser
- **Wavelength**: 2123 nm
- **Power at fibre tip**: 2.5 - 20 W (adjustable)
- **Pulse energy**: 0.5 - 2.6 J
- **Frequency**: 5 - 15 Hz
- **Pulse peak power**: 7 kW
- **Beam delivery**: wide range of flexible silica fibres, same fibre port for both lasers
- **Fibre identification**: optical
- **Aiming beam**: 635 nm (red) or 532 nm (green), max. 1 mW (adjustable)
- **Mains supply**: 208 - 240 V AC, 50/60 Hz, (1~, N, PE), max. 16 A
- **Cooling system**: integrated cooling
- **Dimensions**: H 1025 x W 420 x L 1007 mm (height w/o display)
- **Weight**: 185 kg
- **Environmental conditions**: 15 - 28 °C / 10 - 90 % humidity (non-condensing)

### IMPORTANT NOTICE:

The information provided is a general overview of potential clinical applications of the described products.

National health care regulations vary between countries and may exclude certain clinical applications at your location. The user assumes responsibility to be updated about national deviations from the applications listed above.

*In the USA the products are not intended for use in clinical applications in neurosurgery.*