LIMAX®

The diode-pumped Nd:YAG laser Limax®

satisfies the highest demands
for treatment quality and operating convenience

KLS martin GROUP

"Metastatic resection with the Limax® laser enables the gentle removal of multiple metastases while preserving the healthy tissue to the greatest possible extent. Even patients that previously had to be classified as inoperable can be excellently treated with this new laser technique.

With its very high output power of up to 120 W, the Limax® laser from KLS Martin saves me a lot of time as it speeds up the whole process significantly, compared with previous types of laser. Moreover, my surgical team loves to work with the Limax® as well, due to its intuitive handling and the full integration of peripheral devices such as a smoke evacuator and a gas irrigation unit."

Prof. Dr. Bernward Passlick (MD)
Medical Director,
Department of Thoracic Surgery
Medical Center – University of Freiburg, Germany

"The use of KLS Martin Limax® lasers represents an important step forward in the resection of pulmonary metastases. As healthy tissue can be preserved to a great extent, the patient's post-operative quality of life is enhanced significantly. Moreover, the tissue-preserving resection of metastases with the Limax® laser ensures that patients can be reoperated in case of need.

From an economic point of view, using the laser method makes a lot of sense, too, as the tissue-preserving resection of metastases with the Limax® laser allows the treatment of patients who previously had to be classified as inoperable. Besides, the laser simply eliminates high costs for consumables such as staplers."

University lecturer Dr. Thomas Graeter, M.D.
Chief Physician of the Clinic
for Thoracic and Vascular Surgery,
Loewenstein, Germany

The diode-pumped Nd:YAG laser Limax® satisfies the highest demands for treatment quality and operating convenience

With the launch of the new diode-pumped Nd:YAG laser Limax®, surgeons have a laser system at their disposal which offers a triple advantage, combining the excellent beam quality of solid state lasers with an extremely high output power for faster interventions and a wavelength specially optimized for use on parenchymal tissue.

The use of lasers with a wavelength of 1,320 nm has gained more and more ground in recent years, especially for the resection of multiple metastases. The optimal coefficients of absorption in both water and hemoglobin – exclusively attainable with the 1,320-nm wavelength – are just perfectly suited for cutting, coagulating and sealing parenchymal tissue.

Apart from its clinical advantages, this new laser is a great economic solution as well. It not only saves you a lot of money on consumables, but also boosts the number of patients eligible for laser therapy.

Reliable resecting, coagulating and sealing
while preserving healthy tissue to the greatest possible extent

The wavelength of 1,320 nm enables precise resection in parenchymal tissue. Thanks to its optimal ratio of absorption in water and hemoglobin, this wavelength lets you achieve excellent sealing results. In other words, precise lesion resection with maximum preservation of healthy tissue.

Bronchoscopy is another field where selecting the right wavelength is of primary importance. Due to their low absorption in hemoglobin, wavelengths above 1,320 nm cannot produce the intended coagulation effect, but primarily lead to tissue desiccation instead. The 1,320-nm wavelength is different because of its first-rate absorption in hemoglobin. It therefore prevents unwanted side effects such as dreaded edemas. Besides, the pulsed operating mode allows it to be used for gentle, tissue-preserving endobronchial applications as well.

The surgical advantages of the Limax® system at a glance:

- Greatest possible preservation of healthy tissue
- Maximum precision – even the most difficult localizations can be treated
- Flexible, yet mechanically strong coagulation zones allow for visceral pleura sutures for increased safety
- Dry (hemorrhage-free) and fistula-tight resection surfaces
- Intervention can be repeated in case of recidivation
- Significantly increased life expectancy with almost no loss in the quality of life

Limax® – the surgical laser and its fields of use

Application examples for open thoracic surgery:

- **Metastatic surgery**
- Parenchymal bridge transection
- Pulmonary vesicle resection
- Open pulmonary biopsies
- Removal of benign tumors
- Bronchial carcinoma operations

Surgical techniques available:
Enucleation, wedge resection, lobectomy, typical and atypical segmental resections, bisegmentectomy (plus a combination of any of these procedures)

Application examples for endobronchial surgery:

- Tumor ablation
- Removal of stenoses
- Vaporization of pathologic tissue
- Hemostasis

Application examples for thoracoscopic surgery (VATS):

- Pulmonary vesicle ablation and thermal pleurectomies in cases of spontaneous pneumothorax
- Air vesicle ablation in pulmonary emphysema cases
- General hemostasis and fistula sealing
- Removal and enucleation of pleuropulmonary coin lesions (malignant and benign tumors)
- Partial resection of lung tissue
- Recurring pneumothorax
- Adhesiolysis
- Pleurodesis (various causes)

Application examples for visceral surgery:

- Metastatic surgery on liver, kidneys and spleen
- Benign tumor surgery
- Open biopsy on liver, kidneys and spleen
- Carcinoma resection on liver, kidneys and spleen

Application examples for phlebology:

- Endovenous laser occlusion of saphenous veins
- Endovenous laser occlusion of perforating veins
- Endovenous laser occlusion of lateral saphenous branches

The economical advantages at a glance:

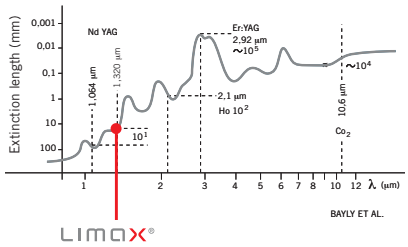
- Savings in expensive consumables (e.g. stapler magazines, fibrin glues)
- Extended interdisciplinary indications in open thoracic surgery, thoracoscopy, endobronchial surgery, visceral surgery and phlebology, therefore more patients can be treated
- The KLS Martin laser Limax® enables the inclusion of patients that were previously considered “inoperable”
- Enhanced hospital reputation due to use of innovative laser technology and advanced methods
- Optimal utilization by ambulatory use of the laser in phlebology

Optimal wavelength – superior beam quality, intuitive handling

The diode-pumped Nd:YAG laser Limax® represents a significant step forward in parenchymal laser surgery.

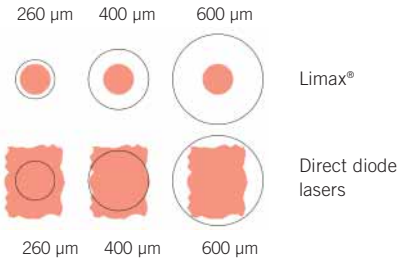
Optimal wavelength

Due to its specific wavelength of 1,320 nm and the high coefficients of absorption in water and hemoglobin associated with it, the Limax® is perfectly suited for combining resection, coagulation and tissue sealing effects for optimal control of the two greatest problems when working on lung parenchyma – hemorrhages and air loss.



Best beam quality

In contrast to direct-diode lasers, the diode-pumped Nd:YAG laser Limax® emits laser radiation of constant quality, irrespective of the set power. Whereas the beam diameter of direct-diode systems increases with increasing power and beam precision decreases strongly as a result, the Limax® system enables the surgeon to work at a constant beam quality with a power of up to 120 W. This allows for fast operations with maximum power densities of >100 kW/cm² and fibers with very small diameters of 260 µm.



Intuitive operation

In addition to the laser, the Limax® system integrates a dedicated smoke evacuator and gas irrigation unit into a single, compact platform.

Besides, all the parameters for these components can be controlled intuitively via the Limax® software and stored according to the user's preferences

The technical advantages at a glance:

- Optimal wavelength
- Integrated smoke evacuator
- Intuitive handling
- User-customizable standard programs
- No heavy-current connections required
- Low-noise operation
- Best beam quality
- Integrated gas irrigation
- Highest power densities
- Very comprehensive set of accessories
- Service-friendly design
- Extremely low-maintenance

Autoclavable focusing handpiece

The fully autoclavable focusing handpiece* enables precise laser application on a non-contact basis. Ultra-high power densities guarantee optimal results when sealing, cutting or coagulating parenchymal tissue.

In short, the focusing handpiece makes laser application still safer and more convenient.

Perforation risks due to tissue sticking to contact fiber tips (bare fibers) are absolutely eliminated. Moreover, the autoclavability of the entire system guarantees perfect hygiene in the surgical field.

No tissue adhesion – No need for intraoperative fiber preparation – Optimal hygiene

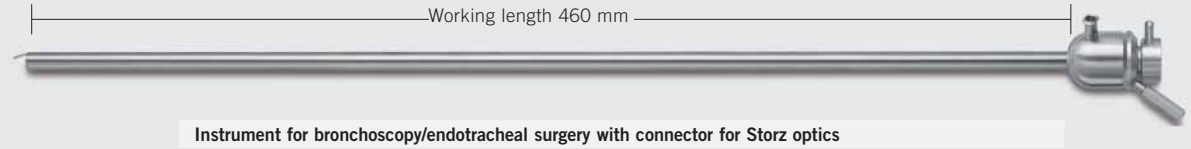
78-201-10-04	Focusing handpiece Limax®, autoclavable*
79-302-40-04	Supply fiber, 400 µm, autoclavable

* Can be used only with the diode-pumped Nd:YAG laser Limax®

Instrument for Bronchoscopy/Endotracheal Surgery

- Tumor ablation
- Stenosis removal
- Vaporization of pathologic tissue
- Hemostasis

The instrument is used in conjunction with highly efficient “bare fibers” offering outstanding beam characteristics.



Instrument for bronchoscopy/endotracheal surgery with connector for Storz optics	
78-312-00-04	Ø 5.5 mm, 0° or 30° (Storz item numbers 10320 AA or 10320 BA)
	external diameter: Ø 8.5 mm, for Storz universal bronchoscope (Storz item number 10318 B)
	fiber channel diameter: 0.6 mm fits 300-µm bare fibers (79-700-30-04)

Instrument for Thoracoscopy

- Pulmonary vesicle ablation and thermal pleurectomies in cases of spontaneous pneumothorax
- Air vesicle ablation in pulmonary emphysema cases
- General hemostasis and fistula sealing
- Removal and enucleation of pleuropulmonary coin lesions (malignant and benign tumors)
- Partial resection of lung tissue
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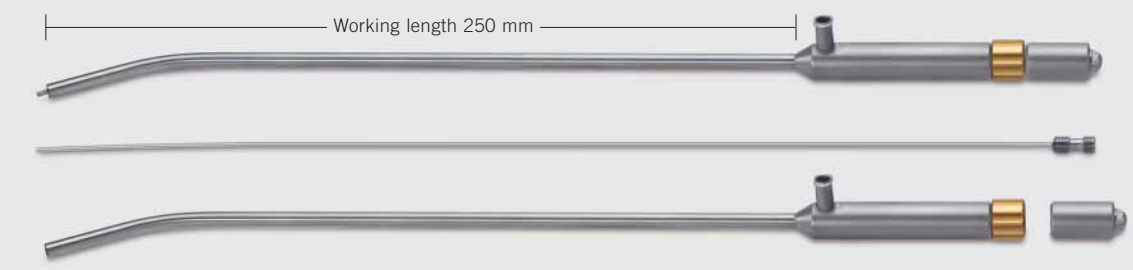

Instrument for thoracoscopic surgery (complete)	
78-313-00-04	with Luer-Lock connector
	external diameter: Ø 5 mm
	fiber channel diameter: Ø 1.3 mm

fits the following bare fibers	
79-700-30-04	300 µm
79-700-40-04	400 µm
79-700-60-04	600 µm

Flexible quartz fibers

- Maximum flexibility
- Extremely small spot diameters
- Unsurpassed power densities

79-700-30-04	Bare fiber, 300 µm, 3 m, pack of 5 (Thoracoscopy, endotracheal surgery)
79-700-40-04	Bare fiber, 400 µm, 3 m, pack of 5 (Thoracoscopy, endobronchial surgery)
79-700-60-04	Bare fiber, 600 µm, 3 m, pack of 5 Thoracoscopy, endobronchial surgery)
79-700-41-04	Bare fiber, 400 µm, 3 m, autoclavable (Open thoracic surgery, thoracoscopy and endobronchial surgery)
79-700-61-04	Bare fiber, 600 µm, 3 m, autoclavable (Open thoracic surgery, thoracoscopy and endobronchial surgery)

79-700-45-04	Gas-irrigated fiber, 3 m, pack of 5 (for endobronchial surgery)

Fiber preparation set

- Autoclavable
- Utmost ease of use
- Universally applicable
- Unrivaled economy

Fiber preparation set, autoclavable, complete:	
79-111-00-04	Fiber preparation set consisting of:
	Fiber stripper 300, 400, 600 µm
	Silicone mat
	Knife (can be used only for bare fibers)

Fiber Holders

Modular system consisting of handpiece and attachment tips (5-28 cm) for all types of interventions using the laser fiber in contact mode on the skin surface or in body cavities

Handpiece	
78-300-10-04	Handle
78-300-01-04	Handle spare parts set

Detachable tips with bending mandrel	
78-310-05-04	5 cm
78-310-08-04	8 cm
78-310-13-04	13 cm
78-310-18-04	18 cm
78-310-23-04	23 cm
78-310-28-04	28 cm
78-310-01-04	Tip with Luer-Lock connector

Suggested Limax® set

Art. No.	**Unit**	**Description**
79-050-00-04	1	Limax® 120 diode pumped Nd:YAG laser with integrated smoke evacuator
78-201-10-04	2	Focussing handpiece Limax®, autoclavable
79-302-40-04	1	Fiber for focussing handpiece, 400 µm, autoclavable
78-215-03-04	1	Pressure hose from Dräger central gas supply to Limax®
79-100-31-04	1	Gas irrigation tube Limax® to fiber
80-181-90-04	1	Sterile filter for gas irrigation, sterile, disposible (50 pcs.)
79-100-56-04	4	Universal laser protection goggles
80-060-01-04	1	Main filter for smoke evacuator
79-225-08-04	2	Suction tube for smoke evacuator Ø 22 mm, length 3.0 m, autoclavable
79-225-05-04	1	Pre-filter for smoke avacuator, Ø 22 mm, sterile, disposible (50 pcs.)

* country-specific pressure hoses available on request

Technical data

Limax® 120 with integrated smoke evacuation		
Laser type	Diode-pumped Nd:YAG laser	
Laser wavelength	1,320 nm ± 10 nm	
Laser output power	2 – 120 W	
Pulse type	Continuous pulse	
	Single pulse:	pulse on-time: 0.1 s – 10 s
	Pulse train, adjustable:	pulse on-time: 0.1 s – 10 s
		pulse off-time: 0.1 s – 10 s
Pilot laser wavelength	635 nm	
Pilot laser power	5 mW, adjustable 2–100%, pulsating	
Beam delivery	Laser fibers, focusing handpiece	
Laser beam quality	Numerical aperture < 0.22	
Light guide connector	SMA-plus socket, mechanically coded SMA socket	
Control and monitoring	2 microprocessors	
Operation	Rotary pushbutton and membrane keypad, 8.4" color display	
Cooling	Compressor air cooling	
Mains power supply, version E (U)	230 V ± 10%; 50/60 Hz (110–230 V ± 10%; 50/60 Hz)	
Mains current	Max. 16 A (max. 30 A)	
Mains fuses	2 x T 16 A and 2 x T 6.3 A (2 x T 30 A and 2 x T 16 A) [T = slow-blow]	
Power input	3,300 VA	
Laser class	4	
Protection class	I	
Type of protection	IP X1	
Classification acc. to MPG/MDD	II b	
Pilot laser	3R	
Noise level	Neutral/no-load: 51 dB(A); full load: 60 dB(A)	
Smoke evacuator (VAC)	Integrated plug-in unit	
VAC control	CAN bus control via Limax®	
VAC mains power supply	110 – 230 V ± 10%; 50/60 Hz	
VAC mains current	Max. 16 A	
VAC mains fuses	2 x T 16 A (slow-blow)	
VAC power input	400 W	
Dimensions (W x H x D)	50 x 107 x 59 cm	
Weight (laser with integrated VAC)	120 kg	
Environmental conditions for transport and storage (without cooling water)	Ambient temperature:	-15°C to +50°C (+5°F – 122°F)
	Relative humidity (non-condensing!):	10% to 80%
	Atmospheric pressure:	700 hPa to 1060 hPa
Environmental conditions for operation	Ambient temperature:	+15°C to +30°C (59°F – 86°F)
	Relative humidity (non-condensing!):	30% to 75%
	Atmospheric pressure:	900 hPa to 1060 hPa
EMC Directive	89/336/EEC	
CE-marking	In conformity with 93/42/EEC	
Safety check	Annually	

Subject to technical modifications

Technical data

Limax® 60		
Laser type	Diode-pumped Nd:YAG laser	
Laser wavelength	1,320 nm ± 10 nm	
Laser output power	5 – 60 W	
Pulse type	Continuous pulse	
	Single pulse:	pulse on-time: 0.1 s – 10 s
	Pulse train, adjustable:	pulse on-time: 0.1 s – 10 s
		pulse off-time: 0.1 s – 10 s
Pilot laser wavelength	635 nm	
Pilot laser power	5 mW, adjustable 2–100%, pulsating	
Beam delivery	Laser fibers, focusing handpiece	
Laser beam quality	Numerical aperture < 0.22	
Light guide connector	SMA-plus socket, mechanically coded SMA socket	
Control and monitoring	2 microprocessors	
Operation	Rotary pushbutton and membrane keypad, 8.4” color display	
Cooling	Compressor air cooling	
Mains power supply, version E (U)	230 V ± 10%; 50/60 Hz (110–230 V ± 10%; 50/60 Hz)	
Mains current	Max. 13 A	
Mains fuses	2 x T 16 A and 2 x T 6.3 A	
Power input	3,000 VA	
Laser class	4	
Protection class	I	
Type of protection	IP X1	
Classification acc. to MPG/MDD	II b	
Pilot laser	3R	
Noise level	Neutral/no-load: 51 dB(A); full load: 60 dB(A)	
Dimensions (W x H x D)	50 x 107 x 59 cm	
Weight (laser with integrated VAC)	110 kg	
Environmental conditions for transport and storage (without cooling water)	Ambient temperature:	-15°C to +50°C (+5°F – 122°F)
	Relative humidity (non-condensing!):	10% to 80%
	Atmospheric pressure:	700 hPa to 1060 hPa
Environmental conditions for operation	Ambient temperature:	+15°C to +30°C (59°F – 86°F)
	Relative humidity (non-condensing!):	30% to 75%
	Atmospheric pressure:	900 hPa to 1060 hPa
EMC Directive	89/336/EEC	
CE-marking	In conformity with 93/42/EEC	
Safety check	Annually	

marVAC®	
Control	CAN bus control via Limax®
Power supply	100-240 V ± 10%; 50/60 Hz
Appliance air flow	> 750 l/min
Power input	< 500 W / 740 VA
Protection class	I
Classification acc. to MDD	I
Type of applied part	CF; defibrillation-proof
Main filter	ULPA efficiency 99.9999% @ 0.1 micron, for tube size Ø 22 mm and Ø 10 mm
EMC	Keeps limits according to EN 55011 and IEC 60601-1-2 Immunity according to IEC 801
CE-marking: conform with 93/42/EEC	Class I medical device

Subject to technical modifications

Ordering information for
Limax®, marVAC® and accessories

Ordering data

Limax®	Unit	Item no
Diode-pumped Nd:YAG laser Limax® 120 with integrated smoke evacuation	1	79-050-00-04
Diode-pumped Nd:YAG laser Limax® 60	1	79-051-00-04
Optional:		
Console "flyer"	1	79-120-00-04
Flyer arm for Limax®	1	79-050-01-04

marVAC®		
Smoke evacuation system marVAC® 220–240 V incl. main filter unit (item 80-060-01-04)	1	80-060-00-04
Interlink cable marVAC® to Limax® 60	1	79-800-02-04
Main filter unit for smoke evacuator marVAC® (ULPA standard)	1	80-060-01-04
Funnel, flattened on one side, with Ø 22 mm connection,	1	79-225-02-04
can be autoclaved 50 times at max. 134°C (273°F) Plastic suction tube with cone connection for suction hose Ø 22 mm,	1	79-225-03-04
can be autoclaved 50 times at max. 134°C (273°F)	1	
Prefilter (HEPA standard) with ∅ 22 mm connections (m/f), sterile, single use (packaging unit = 50 pieces)	1	79-225-05-04
Air hose Ø 22 mm, 3.0 m long, multi-use; can be autoclaved 50 times at max. 134°C (273°F)	1	79-225-08-04
Air hose Ø 22 mm, 1.8 m long, sterile packed (packaging unit = 25 pieces)	1	79-225-10-04

For further information please refer to our accessory brochure.

Washing tray		
Washing tray for autoclavable laser focusing handpiece and autoclavable supply fiber	1	78-201-14-04
complete, consisting of:		
Mesh tray 1/2, 243 x 255 x 33 mm	1	55-805-24-01
Lid for mesh tray	1	55-805-28-01
Silicone net for mesh tray	1	55-807-25-04
Separator for mesh tray, 123 x 9 x 22 mm	6	55-806-50-04
Silicone rinsing tube, Luer-lock, f/m, Ø 6 x 3 mm, length 30 cm	1	78-215-05-04

Clinical training

Education and workshops

Optimize the use of our products by taking part in our extensive training program.

In cooperation with globally recognized and experienced users, KLS Martin is regularly offering education courses with thoracoscopic topics in focus.

Among those are:

- Hospitations at the sites of experienced users
- Dedicated laser courses acknowledged by the German medical associations
- Ultrasound courses
- On-site training by our experienced product specialists

Please ask your KLS Martin product specialist about our wide choice of education possibilities to design the right program individually for your needs.

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