LA GUIDA

AI VANTAGGI DEL LASER TRABECULOPLASTICO SELETTIVO (SLT) NEI PAZIENTI AFFETTI DA GLAUCOMA

Vi presentiamo alcuni interessanti articoli riguardanti l’uso del laser SLT per pazienti affetti da glaucoma. La terapia SLT offre un'opzione di trattamento sicura per i pazienti con glaucoma ad angolo aperto che hanno avuto scarso successo dopo aver assunto la terapia topica convenzionale. Con anche il vantaggio della possibilità di poter ritrattare i pazienti più volte per i casi più difficili.

Laser trabeculoplasty opening doors for open-angle glaucoma patients

A low-energy form of the procedure has helped to address safety concerns

Dr Andrij Savich

Dr Savich

Prostaglandin-based topical therapy has been the 'go-to treatment' for open-angle glaucoma for decades. In contrast, laser trabeculoplasty has conventionally remained reserved for patients unresponsive or unable to adhere to medication-based therapy.

Recent years, however, have brought the level of technologic advancement needed to move laser trabeculoplasty into the limelight as an effective open-angle glaucoma treatment.

However, with argon laser trabeculoplasty (ALT)—the original laser therapy for glaucoma—requiring a hot, high-energy laser that carries a noteable risk of collateral damage to surrounding tissue, safety concerns are a key disadvantage.

Fortunately, the subsequent development of a cool, low-energy form of the procedure, called selective laser trabeculoplasty (SLT), has helped to ameliorate safety concerns.

By using a low-energy, Q-switched, frequency-doubled Nd:YAG laser with a short exposure time of up to 5 ns, the SLT laser is primed to specifically target pigmented trabecular meshwork cells without damaging surrounding tissue.1 And studies show that SLT is just as effective as ALT at lowering IOP in glaucoma patients.[1,2]

Spurred by encouraging reports about the efficacy of SLT laser systems, I have spent recent months using the OptoYAG and SLT laser system (Optotek d.o.o, Slovenia) in my clinic in Ivano-Frankovsk, Ukraine. While doing so, I have been pleasantly surprised at how easy it has been to integrate an advanced piece on technology within my practice, and I have also become more aware of the realities of using laser technology to treat a condition that is classically managed with eye drops.

Seeing the advantage

The system is a combined unit that consists of two lasers—a ND:YAG and SLT laser—used for different applications. As the ND:YAG laser has penetrative properties, it is best utilised in the treatment of diseases in which there is a need to create a hole or incision in tissue.

For example, the laser is used during iridotomy and in the treatment of secondary cataract or limited regional haemorrhages. For the latter, the creation of a small hole allows blood to move into the vitreous humour, where it can be absorbed without detriment to ocular health.

In contrast, the SLT laser stimulates tissue rather than cutting through it. As such, when applied to an eye with open-angle glaucoma, the laser stimulates the pigmented trabecular cells and macrophages responsible for filtering and draining the aqueous humour, thus triggering a clearance process in the trabecular meshwork,[3] which, in turn, lowers the elevated IOP seen in open-angle glaucoma.

An important observation I have made while working with the SLT laser is that the results achievable are strongly influenced by disease. Patients at stages 1 and 2 of the disease seem to achieve better outcomes than those at later stages. Specifically, mean IOP reductions of 5.9 and 5.7 mm Hg were achieved among my patients with stage 1 and 2 glaucoma, respectively.

Of note, these levels of reduction were seen in more than 80% of patients. In comparison, SLT therapy was effective in no more than 50% of my stage 3 patients, resulting in a mean IOP reduction of only 4.7 mm Hg among this group at 1 to 3 months post-SLT.

Published literature, including a 2016 study by Schlote et al., support my observation that SLT outcomes are worse with advanced open angle glaucoma.[4] This suggests that while such technology

IN SHORT

- ***SLT therapy provides a safe and efficacious first-line treatment option for open-angle glaucoma patients who have had little success after taking conventional topical therapy.***

is exciting and offers favourable outcomes for glaucoma patients, it is important to recognise that such outcomes are not universal for all patients. Thus, it is vital that the treating physician selects patients for treatment appropriately.

In addition to disease stage, other factors, such as angle width and pigmentation level, influence both the outcomes obtainable with SLT and the technical settings that must be used when treating patients with the laser.

For example, in eyes with a higher degree of pigmentation, it is better to use a relatively low energy beam or apply treatment in several stages to minimise the risk of burns. In eyes with low levels of pigmentation, SLT is not really worthwhile as its ability to lower IOP in such eyes is minimal. Similarly, this treatment is typically ineffective in patients with pseudoexfoliation glaucoma.

As with any therapeutic intervention, while SLT laser offers great benefits and outcomes, it does carry a risk, albeit a low one, of side effects. My experience with the laser revealed just one case of IOP increase among a treatment group with more than 100 patients.

In this case, IOP rose to 35 mm Hg after SLT treatment. However, it dropped back to normal levels within two weeks (during which hypotensive eye drops were used to maintain IOP at acceptable levels). But as transient IOP rise has been widely reported after laser procedures, this is an observation that is not too unexpected.[5]

Rectifying misconceptions

It is often believed by physicians and patients that laser therapy is a very expensive treatment that the average person simply cannot afford. In reality, however, the cost of laser-based glaucoma treatment is comparable with the cost of a 5-month supply of eye drops.

Given the longer lasting outcomes achieved with SLT and the one-time investment, it is actually more cost effective to have laser therapy than continue on long-term topical therapy. This misconception highlights a need for improved education on this treatment modality among physicians and patients, to ensure that patients who stand to benefit both financially and phsyically from opting for laser therapy over medication are presented with all their options at an early-disease stage, when good outcomes are still achievable.[6]

Some physicians may also hold the belief that a combined system will be more complicated than a conventional YAG laser or traditional ALT. With features such as fine-energy setting buttons located next to the joystick included in the device for ease of use, there is no significant learning curve with this device compared with standard YAG lasers.

Physicians used to using ALT in open-angle glaucoma will notice increased treatment precision on making the switch to SLT. This is because the SLT's 400 µm laser beam diameter covers the full size of the trabeculae, thus eliminating a need for extremely accurate aiming.

In contrast, the laser beam used in ALT has a diameter of 50 µm, which will always require greater aiming precision to deliver the best treatment outcome possible—no matter how skilled the surgeon. Furthermore, when the ALT laser is used, there is a risk of rebound increase in IOP 6 months after treatment that is not seen with SLT.[7]

Conclusion

SLT therapy provides a safe treatment option for open-angle glaucoma patients who have had little success after taking conventional topical therapy for several years. With the added benefit of proven efficacy and safety as a first-line treatment in these patients, it seems the adoption of SLT in glaucoma treatment is likely to grow in coming years.

As a procedure that produces similar outcomes to those achieved with eyedrops, SLT offers the added advantage of eliminating the compliance problem that is often seen with patients on long-term eyedrop therapy (that is, with their eye drops and follow-up appointments).

Cost savings from a single laser treatment versus years of multiple eye drop regimes are also worth noting. This further adds to my confidence in the future of SLT in open-angle glaucoma treatment.

However, a key factor that is likely to make or break the uptake of this procedure by eye care practices worldwide is proper education of both patients and ophthalmologists. This will be vital in ensuring that only the most appropriate patients (early-stage glaucoma patients) are selected for treatment. By doing so, this promising technology can consistently be used to its full advantage and deliver the exemplary results for which it is capable.

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When MIGS Goes Awry

Using your laser to optimize outcomes and treat complications

By Dan Lindfield

The last five years has seen the rise of MIGS – in terms of the "micro invasive" approach, and the devices that go with them. The information that's currently out there (and there's little beyond manufacturer-sponsored studies at the moment) suggests that, relative to interventions like trabeculectomy or tube shunts and valves, it's a relatively safe approach to moderately lower IOP. MIGS, however, is not a panacea. There are other options, such as selective laser trabeculotomy (SLT), to control a patient's IOP that are often worth pursuing first, and it's definitely worth bearing in mind that the MIGS umbrella encompasses many unique devices, with unique implantation techniques, unique learning curves – and also unique issues.

Every ophthalmology department has a laser – and it's more useful than you might think. I want to tell you about how I use YAG and Argon lasers to fix some of the issues that can arise with MIGS devices – and how this can be achieved in the clinic, rather than requiring a return to the operating theater for surgical stent revision.

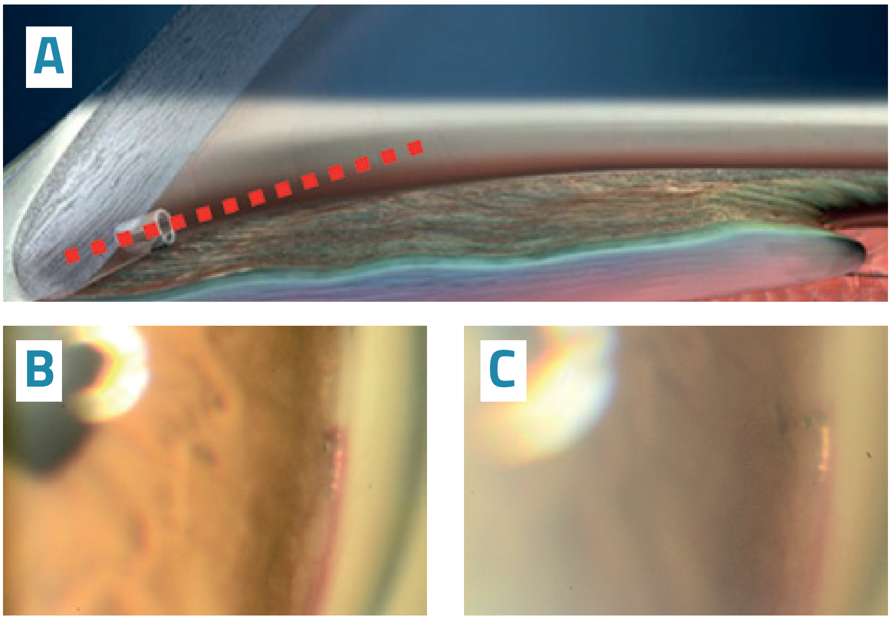

Figure 1. iStent: an illustration of a perfect insertion (a). However, if the angle of the stent's lumen points down toward the iris (b), rather than being perpendicular or upwards toward cornea, this can be a problem. If the lumen points below this plane (red dotted line in (a)) or if the angle is cramped, then there's an increased risk of the iris "surfing" into stent lumen when the flow of aqueous is higher. YAG laser energy can be used to unblock the iStent and ablate some of the iris to stop it from becoming blocked again (c).

Optimizing outcomes

There can be a big difference between what you can visualize with pre-operative gonioscopy at the slit lamp and what you can see through a gonio lens during surgery. First, patients can be more mobile on the operating table due to anxiety. Second, and most importantly, it's about optics and lighting. It's easy to get an adequate gonio view at the slit lamp and clearly define the corneal light wedge and Schlemm's canal. Intraoperative microscopy is always coaxial,

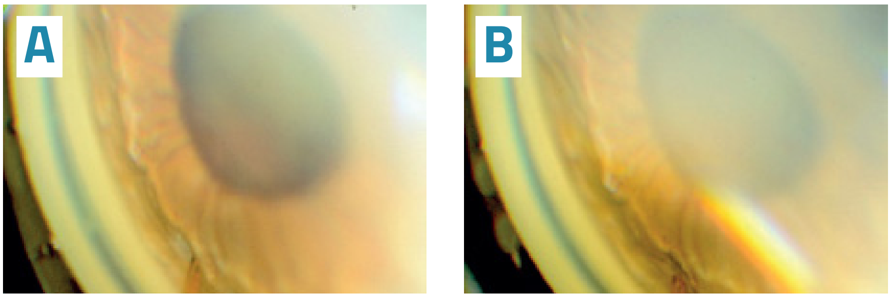

Figure 2. A poorly positioned Xen stent (a) where the flat tip has been blocked, and post-YAG laser treatment (b) – still flat to the iris, but the tip has been cleared, and an "iridoplasty crater" has been created to prevent further blockage.

meaning you can't illuminate obliquely, which makes it harder to identify exactly where you want to place the stent. Normally or heavily pigmented angle structures might be adequately visible under these conditions – but this isn't the case with very pale angle structures. When I come across this during slit lamp gonioscopy, I use an Argon laser to "mark" the meshwork in the nasal quadrant (in three areas usually) meaning I just have to insert my stent on the mark during surgery. Anecdotally, because the region has also been photocoagulated by the laser, it also reduces the hemorrhage that sometimes occurs as the sharp tip of iStent enters the angle.

Treatment complications

Anything with a lumen in the eye can get blocked, and MIGS devices are no exception. Be it blood, fibrous or inflammatory membrane – or even iris tissue – it's important to note that, rather than performing revision surgery, you can use a few shots of a YAG laser to clear the blockages. There are a number of risk factors for stent blockage – and a lot of it comes down to ocular anatomy. Let's take the iStent (Glaukos) as an example (Figure 1). If you're placing an iStent into an eye that's slightly shallow or the angle is not wide open, the iris is, by definition, quite close to the stent. If your patient's iris is a bit high, or for some reason, someone's dilated the pupil, the pupil can plug the lumen of the stent. The iStent lumen can rotate anteriorly or posteriorly whilst still perfectly seated in the canal. If you leave the stent pointing to the cornea it should never block. However, leaving the lumen pointing below the iris plane (or if your stent rotates) results in an increased risk of problems. These risks increase in shallow eyes and eyes with narrow angles – there's simply less margin for error. A recent review of the iStent literature (1) found that the rates of occurrence of malpositioning and occlusion that necessitated surgical intervention (YAG laser, tissue plasminogen activator [tPA], or stent revision) ranged from 4.5–11.3 percent – and was cited as the most common complication across the studies. But irrespective of whether the iStent has become malpositioned and blocked because of anatomy, poor surgical technique, postoperative movement or plain bad luck, it can be fixed with the YAG laser in just a few shots – in the clinic, rather than the operating theater. After all, prevention is better than cure.

Box 1. Treatment of blocked iStent

Blood in lumen. Wait, try steroid drops, YAG laser to clear if no response at 2 weeks.

Inflammatory membrane. Wait, steroid drops, tPA injection in anterior chamber at 1 week, YAG laser to clear at 2 weeks.

Iris blockage. Don't wait. Try Pilocarpine - see 1 hours. Argon laser iridoplasty around the tip to contract. YAG laser to clear any remaining strands.

It's a similar story with Xen (Allergan): it's a longer stent, and it can go much further into the anterior chamber. Problems can arise with Xen if it's inserted too posteriorly (below the trabecular meshwork, closer to the iris), or even if it's inserted at the correct angle landmark, but the stent extends too far into the anterior chamber – resulting in iris block in the mid-periphery. The emphasis has to be getting this right the first time by using an intraoperative gonio lens to place the Xen rather than the unguided/ "blind" Xen insertion approach some surgeons take. Having said that, if iris block or iris chafing occurs, this can result in persistent uveitis and inflammation, so it needs to be dealt with promptly (Figure 2).

Again, the laser can help. If there's hemorrhage, the best course of action is to use the YAG laser to clear the stent early – it's important to get aqueous flowing early though the Xen. If you wait for the hemorrhage to clear naturally then you risk a situation of no flow down the tube and conjunctival healing/scarring and early bleb failure. It's the same with inflammatory membranes – you really do need early flow to protect the bleb. In essence, the message is: use the laser, don't wait for the medication to work.

So once again, the approaches I take to fix these situations are:

i. Clear any blockage – I use my Optotek YAG laser to quickly clear the stent, and

ii. If the iris is being chafed or snagged, I use an Argon laser to contract the iris out of the way (behind the stent), so there's no longer any contact.

The use of the YAG laser to unblock stents isn't limited to iStent and Xen – the "intracanalicular scaffold" Hydrus (Ivantis) stent has an inlet and three fenestrations that can also be subject to blockage, and can be opened with the YAG laser too. Glaucoma surgeons are familiar and comfortable with using lasers to lower IOP – and, as you can see, they can serve a double purpose with MIGS stents, and help avoid revision surgery in some cases of blockage or malpositioning. As increasing numbers of cataract surgeons are implanting MIGS devices as part of their offerings, I feel it's important they're aware of the utility of these lasers and what they can do.

Dan Lindfield is a consultant ophthalmic surgeon at Optegra, and glaucoma lead at Royal Surrey County Hospital, England, UK, and reports receiving honoraria and travel support from Allergan applicable to Xen.

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www.opotek.com

Optotek Medical Milestones

- 1991 Optotek founded
- 1996 R&D and production of optoelectronic products
- 1997 First laser systems for dermatology produced
- 1999 First ophthalmic laser systems
- 1999 OEM YAG laser system and Q-Las photodisruptor launched
- 2004 HawkEye portable slit lamp launched
- 2007 Acquired by OptoPol technologies
- 2008 LacriMax, OptoYag, OptoSLT, OptoYAG&SLT launched
- 2009 OptoPol technologies acquired by Canon Inc.
- 2014 OEM YAG laser system and OEM combined laser system launched
- 2015 New LacriMax launched
- 2016 OptoSLT nano launched – the first DPSS laser for SLT

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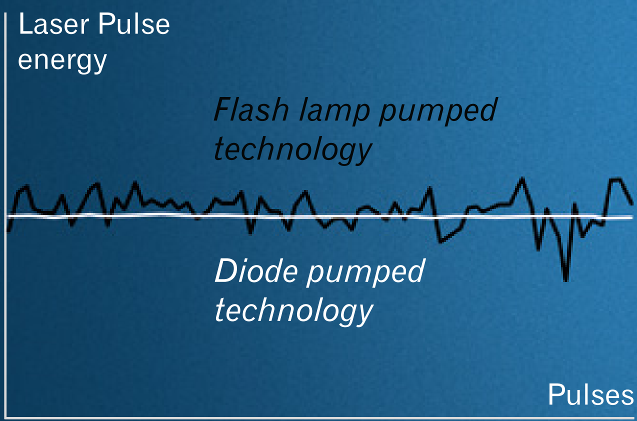
Opto**SLT** nano

The first diode pumped SLT device on the market

True portability of the SLT laser device

Very high pulse to pulse stability



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STABLER PULSES FOR SAFER SLT

The Optotek OptoSLT nano SLT laser shakes up the selective laser trabeculoplasty market

Selective laser trabeculoplasty (SLT) is a standard option for reducing intraocular pressure in glaucoma patients. But this decades-old technique has been transformed by a device that promises safer and faster procedures: OptoSLT nano, the !rst diode-pumped solid-state laser for SLT.

Why the excitement?

First, the OptoSLT nano provides signi!cantly lower pulse variability (± 2.5%) than existing laser devices. One consequence of this is increased pulse speed (up to 5 Hz); another is enhanced safety. Both follow from the highly repeatable pulse energy delivered during treatment – as Andrej Vrecko (Optotek's R&D Manager) says, "OptoSLT pulse energies are an order of magnitude more stable than competing systems."

Second, the OptoSLT nano is highly convenient: it is small, portable and can be used either as a complete device – with its own lifting mechanism and slit lamp – or can be used to upgrade most Zeiss and Haag Streit-type slit lamps.

Adopting the OptoSLT nano does not require disruptive changes to the clinic.

Finally, multiple studies have con!rmed the clinical eOectiveness of one nanosecond laser SLT. The Optotek device is now CE-approved, so ophthalmologists keen to prevent vision loss in their patients now have a faster, safer and more convenient option. "OptoSLT nano will make SLT the !rst-choice procedure for primary open angle glaucoma cases," concludes Vrecko.

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Preserve vision in record time

*Opto**SLT nano** –THE FIRST 1ns SLT DEVICE ON THE MARKET*

Selective Laser Trabeculoplasty (SLT) is an advanced, non-invasive, primary or secondary treatment for raised intraocular pressure (IOP) in glaucoma. It uses short laser pulses of a specific wavelength to selectively target pigmented trabecular meshwork cells without causing widespread thermal damage. Standard SLT utilises a low-energy laser with a short pulse duration of 3-5 ns. This low-energy irradiation stimulates removal of damaged cells by macrophages and increases trabecular network porosity to restore effective aqueous outflow through the drainage angle. This results in the reduction of IOP to non-pathologic levels.

The OptoSLT nano offers a shorter-than-standard laser pulse duration of just 1 ns, with advanced technology in the form of a more stable and efficient solid-state diode-pumped laser technology, thus offering a quicker and safer SLT treatment option.

THE FIRST DIODE PUMPED SOLID STATE LASER DEVICE ON THE MARKET FOR SLT

The OptoSLT nano is a new laser technology that is superior to existing SLT devices on the market. It offers very high pulse to pulse stability (±2.5%). By reducing laser pulse duration to 1 ns without compromising efficacy outcomes, this new technology permits faster (up to 5 Hz) and safer SLT procedures (improved pulse energy repeatability during SLT).

With a compact, highly portable design, the OptoSLT nano is an ideal addition to every doctor's practice. The device's energy levels range from 0.2 to 2.0 mJ and its red diode 635 nm aiming beam ensures precise focusing for highly predictive and effective treatment each and every time.

KEY FEATURES

Diode-pumped solid state laser source
FOR MAXIMUM EFFICIENCY AND SAFETY

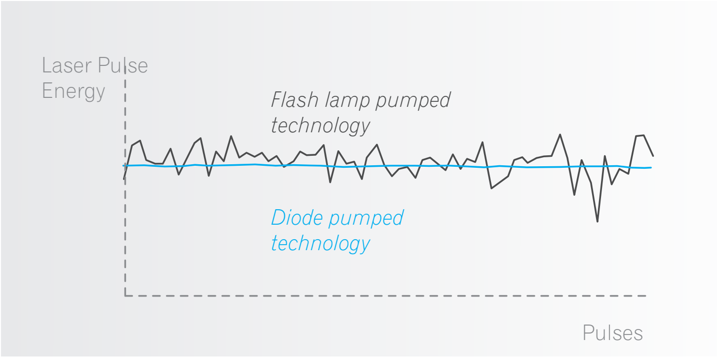
1

The OptoSLT nano features a diode-pumped solid state laser source that offers greater compactness and efficiency than the flash lamp-pumped solid state laser source used in classic SLT devices currently available on the market.
The compact and miniaturized solid state laser used in the OptoSLT nano offers additional safety and reliability benefits.

PPS™ - Pulse to Pulse Stability
FOR BETTER ENERGY STABILITY AND FASTER SLT TREATMENT

2

The new device utilizes PPS™ technology to achieve a very high pulse to pulse stability of ±2.5%, which exceeds that of other existing laser technologies. This technology permits faster SLT procedures (up to 5 Hz) that are even safer compared to current technology on the market (due to improved pulse energy repeatability during SLT treatment).



Multifunctional with slit lamp compatibility
USE AS COMPLETE DEVICE OR TO UPGRADE EXISTING SLIT LAMP

3

The OptoSLT nano has been designed with a sophisticated dual set up. This allows seamless incorporation into any practice as a complete stand-alone device with lifting mechanism and slit lamp or added as an upgrade to most Haag Streit-type slit lamps on the market.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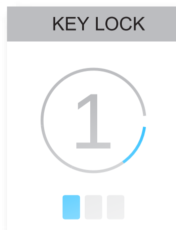
Color display
FOR EASE OF USE

The OptoSLT nano has been designed with ease of use in mind. Its advanced color display is easy to understand and navigate, giving the physician total confidence at all times.

5

Personalized device activation
FOR COMPLETE SAFETY

The laser device is protected with a secure personalized activation system, preventing unauthorised usage. All users must enter a 3 digit electronic key code to activate the device.



6

Innovative docking station platform
TO MEET THE NEEDS OF THE USER

An innovative design allows the user to easily switch between the therapeutic and diagnostic modes of the device.

7

Mobile and portable
FOR ULTIMATE CONVENIENCE AND PRACTICALITY

The OptoSLT nano has a sleek compact design for maximum user convenience. Ophthalmologists can pack the laser device into a small suitcase and transport it to another operating room or hospital with maximum ease and minimal fuss.

TECHNICAL SPECIFICATIONS

Laser source	Q-switched frequency doubled diode pumped Nd:YAG solid state laser
Wavelength	532 nm
Pulse Energy	0.2 – 2.0 mJ (0.1 mJ steps)
Spot Size	400 µm
Pulse Duration	1 ns
Pulse Mode	Single pulse
Max. repetition Rate	5 Hz
Aiming Beam	Red diode 635 nm
Electrical Requirements	100/240 V; 50-60 Hz
Dimensions (H x W x L)	29 x 17 x 18 cm (laser head and docking station)
Weight	5.4 kg (laser head and docking station)
Slit lamp	Compatible with most of Haag Streit - type slit lamps (for compatibiltiy contact Optotek representative). Optotek OEM slit lamp provided upon request.
Standard accessories	Safety eyewear, elbow rest support, dust cover
Optional accessories	Optotek OEM Haag Streit - type slit lamp, motorized lifting mechanism, footswich, five-position magnification changer, gonioscopic SLT lens

Specifications are subject to change without notice.

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