



## FAQ SmartTech Laser

### What is a Femto-/Nanosecond Laser?

A femtosecond laser emits optical pulses with a duration in the domain of femtoseconds ( $1\text{fs} = 10^{-15}\text{s} = 0,000000000000001\text{s}$ ). They also belong to the category of ultra fast lasers or ultra short pulse lasers.

A nanosecond laser emits optical pulses with a duration in the domain of nanoseconds ( $1\text{ns} = 10^{-9}\text{s} = 0,000000001\text{s}$ ). They also belong to the category of fast lasers or short pulse lasers.

To generate such short pulses is nearly always achieved with the technique of passive mode locking.

The SmartTech Laser works with pulse duration around 0.6ns.

In refractive and therapeutic eye surgery this sort of lasers is used to create corneal cuts for multiple surgery methods, e.g. LASIK flap creation for refractive laser correction.

### Can I use the SmartTech Laser for treating keratoconus?

After market launch the SmartTech Laser offers the chance to treat lamellar keratoplasty. This means that the SmartTech Laser is able to create planar lamellas from anterior side. For perfect treatment of keratoconus you need a remaining planar lamellar from posterior side at the recipient eye.

This type of treatment is currently only possible when using the software SCHWIND PALK (Pachymetrie Assisted Lamellar Keratoplasty) in combination with the SCHWIND AMARIS excimer laser.

For more information please contact your local SCHWIND distributor or SCHWIND eye-tech-solutions headquarter.

## What are the advantages of the SmartTech Laser compared to standard femtosecond lasers?

The new technology of the SmartTech Laser offers advantages like...

- ... high mobility on wheels (Dimensions: L x W x H = 110cm x 65cm x 160cm).
- ... reduced lifetime costs
- ... much less opaque bubble layer after flap lift
- ... easier flap lifting. The flap lift works similar easy as with a conventional microkeratome.
- ... an integrated pupil detection for optimized placement of flap creation.

## Why did SCHWIND decide on investing in this technology?

SCHWIND aimed at offering a new and sophisticated technique for the corneal refractive and therapeutic surgeons which provides extreme precision, increases operating comfort and reduces life time cost.

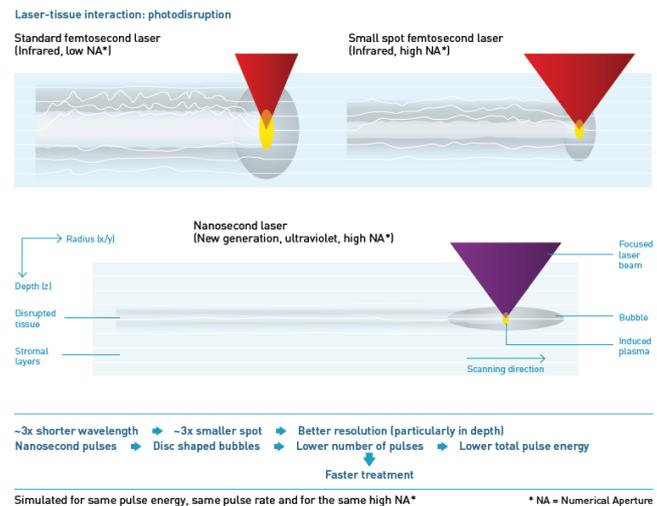
## When will the system be available on the market?

The system will be available in summer/ autumn 2012.

## How does the SmartTech Laser create the flap?

Similar to the Femtosecond laser, the SmartTech Laser applies laser induced plasma to separate the corneal tissue. However, instead of the highly complex technology of the femtosecond laser, an innovative microchip laser is used. Its short wavelength in the UV range (355 nm) and aberration-free optical system ensure extreme precision.

The focal spot size of the SmartTech Laser is just one third of the spot size of standard femtosecond lasers on the market. The low-density plasma combined with a short wavelength leads to a better resolution as the standard fs-lasers and ensures significantly finer structures. That leads to more precise cuts and smoother cut surfaces in LASIK flap procedures, as well as increased safety in flap preparation. The flap can be lifted similarly as with the mechanical microkeratome.



## What is the difference between SmartTech LASIK flap and conventional LASIK flap?

Contrary to the SmartTech LASIK flap, the conventional LASIK flap is created by using a microkeratome.

The accuracy and predictability in flap creation is usually higher when using the laser for flap creation.

## Is the repetition rate higher or the same as compared to other lasers?

The repetition rate of the SmartTech Laser is 150KHz. The repetition rate as single parameter gives no information about the required time for the complete flap creation. The required time for flap creation also depends on spot size and spot distance.

What is presently the maximum possible repetition rate for a nanosecond laser  
150KHz

What are the patient indications?

In terms of patient indications the SmartTech Laser do not differ from the application range of femtosecond lasers.

Will the whole announced application range be available right from the start? If not when do you plan to offer the whole therapeutic application range?

The first application after launch of the SmartTech Laser will concentrate on LASIK flap creation.

The complete application range including anterior lamellar keratoplasty, Intra Corneal Rings, Astigmatic Keratectomy and variable side cuts for keratoplasty, will be integrated as soon as possible.

What are the safety features of the SmartTech Laser?

Basically, the SmartTech Laser meets all requirements of the Medical Device Directive (CE mark) regarding safety features.

Moreover, the focal spot size of the SmartTech Laser is just one third of the spot size of standard femtosecond lasers and the low-density plasma combined with a short wavelength ensures significantly finer structures. That leads to more precise cuts and smoother cut surfaces in LASIK flap procedures, as well as increased safety in flap preparation. The flap can be lifted just as easily as with the mechanical microkeratome.

In addition the SmartTech Laser offers an integrated pupil detection for more accurate placement of the flap according to the planned excimer laser surgery.

How long does the SmartTech procedure take?

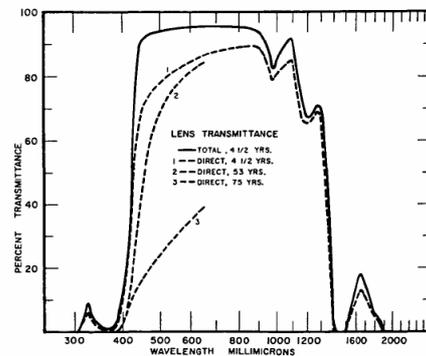
Depending on the cutting parameters the procedures takes around 15 seconds for a LASIK flap.

Do exist any positive experiences with nanosecond technology in corneal refractive and therapeutic surgery so far?

Nanosecond technology is not completely new for eye surgeries. Classical YAG laser are working with nanosecond pulses, but they are using infra red light and no ultra violet. So far, the SmartTech technology is not have been used for corneal and refractive surgery.

What are the potential and/ or additional risks using SmartTech technology in corneal and therapeutic surgery?

Depending on the used wavelength (UV: 355nm) the potential risks are different compared to femtosecond lasers. Potential risks are stromal interface related immune interactions, endothelial cell damage and cataract.



In comparison to infrared light used in femtosecond lasers the retina is only minimal touched by the SmartTech Laser used UV-light. The lens absorbs around 95% of all incoming UV laser light, but only around 50% of incoming IR light. Of course the high UV light lens absorption include a higher risk of possible cataract but the used energy level of the SmartTech Laser is below the damage threshold of the lens.

Radiant exposure for flap cutting is smaller than the damage threshold for photokeratitis, endothelial cell damage and cataract.

First clinical investigations on rabbit eyes and on human cadaver eyes have been confirmed the damage thresholds for photokeratitis and endothelial cell damage.

Investigations for cataract are still pending.

The first outcomes will be published here at the ESCRS in Vienna. Please visit our SCHWIND Lunch Symposium.

For more information please contact our team at our booth.

### Why is the SmartTech Laser working within UV?

The shorter wavelength leads to higher precision in flap creation.

### Do you plan to include laser functions for cataract surgeries in the SmartTech Laser in the long run?

It is a future option for sure.

### How much will it cost to purchase the laser system?

Not available yet, we expect lower life time costs.

### Why is it possible to keep running costs lower compared to femtosecond technology?

The SmartTech Laser works with a mikrochip laser. This very small hand-held laser source is almost maintenance-free (no gas, no fluids, no cooling). The very compact laser source in combination with the durable optical system leads to a significant reduction of life time costs.

### Why should I decide for the SmartTech Laser?

With the decision for SCHWIND the user decides for the specialist in refractive and therapeutic corneal surgery. Established expertise and many years of application experience have made SCHWIND products synonymous with precision, safety and predictability of treatment results. In 1992, the first eye correction with a SCHWIND laser took place. In 1994, the enterprise was the first vendor worldwide to implement serial production of a passive eye tracking system. Since 1999, SCHWIND has concentrated its complete knowledge and all its resources on laser surgery. Launched in 2010, the SCHWIND AMARIS 750s continuously expands its leading position in the refractive market. The innovative, multifunctional and mobile SmartTech Laser impressively substantiates the company's claim to technological leadership. The SmartTech Laser will be the newest product in the SCHWIND range and is based on nanosecond technology. It stands for extreme precision, high flexibility, and low lifetime costs compared to femtosecond lasers.

Do you have any scientific results achieved with the SmartTech Laser so far (e.g. with porcine, rabbit or human eyes)? What are the results?

The first outcomes will be published here at the ESCRS in Vienna. Please visit our SCHWIND Lunch Symposium.

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When do you plan to publish first study results on human eyes?

The first outcomes are planned to be published at the beginning of 2012.

Do you plan to sell the SmartTech Laser in the United States?

It is a future option for sure.

Will you offer a microkeratome in the future, and will you further develop the microkeratome capabilities?

The SCHWIND Carriazo-Pendular is one of the leading microkeratomes in the refractive and therapeutic corneal surgery market and stands for high precision and high quality. For this reason we carry on offering and upgrading the sophisticated SCHWIND microkeratome.

Why has the SmartTech Laser no microscope. Will be a microscope available?

The SmartTech Laser is equipped with a small monitor instead of a microscope. This small monitor will show a live image of the eye during the complete application. This live image is also shown on the main computer screen.

A microscope will be not available.

Is it possible to combine the SmartTech Laser with a SCHWIND excimer laser or any other excimer laser on the market?

Yes of course. It's also possible to combine the SmartTech Laser with any standard excimer laser on the market. . The excimer laser must be equipped with a swivelling bed.

For more information please contact your local SCHWIND distributor or SCHWIND eye-tech-solutions headquarter.

Why is the pulse duration in the nanosecond range and not in the femtosecond range?

Compared to the femtosecond range in the nanosecond range it is possible to create low density plasma bubbles. For that reason the SmartTech Laser uses a more simple und durable laser source.

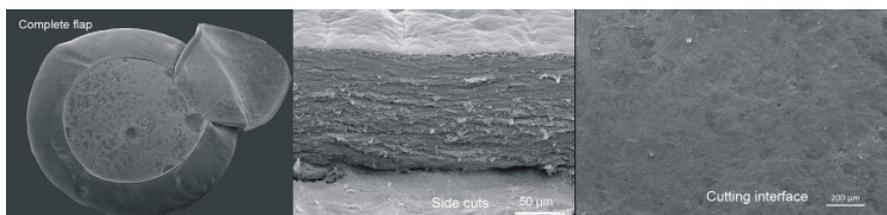
Is it possible to use the SmartTech Laser for refractive correction, too? If not, do you plan to offer this feature?

No, it is not possible yet. At this time no femtosecond technology and even though no nanosecond technology offers the same precision in refractive corneal laser correction like excimer laser do.

But the higher precision of UV offers good opportunities to achieve the same accuracy for refractive corrections, such as current excimer laser. This will be a possible future option for sure.

How is the cutting quality?

The SmartTech Laser provides extremely smooth surfaces for cutting interface and side cuts



### How is the accuracy of flap thickness?

The flap thickness accuracy of the SmartTech Laser is similar to off-the-shelf femtosecond laser.

### What kind of disposables are needed?

Only one disposable is needed for application. The disposable includes patient interface, suction ring and vacuum tubing.

### Are the disposables multiple usable?

No, they are made for single use only.

### Does the SmartTech Laser need consumables like Premix gas or Nitrogen gas?

No, the SmartTech Laser does not need any consumables in working condition. Only sterile disposables as a patient interface are required.

### Which type of laser source is used by the SmartTech Laser?

The SmartTech Laser is using a microchip laser. These lasers are compact, rugged and turnkey ready. They have successfully demonstrated lifetime capabilities of many thousand hours so far, even in tough operating conditions for sealed versions resulting in very low cost for their owners.

### In which way the eye becomes applanated?

The SmartTech Laser patient interface creates a planar applanation on the patient's eye.

### How high is the vacuum for eye fixation?

The range for the surgery controlled vacuum is adjustable from 350 to 600 mmHg.

### What are the parameters for flap cuts?

Flap thickness for LASIK flap is adjustable from 90µm to 170µm.

Flap diameter for LASIK flap is adjustable from 7.5mm to 10.5mm.

Side cuts for LASIK flap and lamellar keratoplasty are variable for angles from 45° to 105°.

Hinge width for LASIK flap is adjustable 360° in steps of 15°.

### What will be the price for the disposables?

Currently is no price available.

### Which physicians already have gained experience with the SmartTech Laser?

It is planned for the near future.

### What does nanosecond pulse technology have in common with nanotechnology?

Nanotechnology is a general term for a wide range of technologies in relation with structures and processes on the nanometer scale. A nanometer is one billionth of a meter ( $10^{-9}$ m) and refers to a border area, in which quantum effects play an important role.

Nanotechnology refers to the targeted production and / or manipulation of individual nanostructures, which at least one dimension smaller than 100 nm

Nanosecond pulse technology is a term in relation with time, respectively laser pulse duration on the nanosecond scale.

The SmartTech Laser works with pulse duration around 0.6ns.