

SCHWIND

eye-tech-solutions



Focus on performance

The SCHWIND AMARIS® product family



Our SCHWIND AMARIS® product family

The absolute best performance
from the leader in technology

The ever-increasing pace of medical advances is a clear indication of the wide range of demands to be met. We pursue a policy of innovation and continuous communication with our customers. The result is the new SCHWIND AMARIS product family, which enables us to provide the perfect excimer laser to meet every requirement. Whichever model you choose, you are assured of a genuine TotalTech Laser.

Progress through innovation

As the leader in technology, we consider it a duty to continually advance the high quality of our excimer lasers.

Our highly specialised team develops new ideas which make new and existing systems even more efficient, user-optimised and safe. In everything we do, our key objective is to enhance quality of life. Thus, your patients have the reassurance of knowing that you are providing the best treatment available.

Top performance, precision and efficiency

The AMARIS family comprises three excimer lasers, each with specific features:

SCHWIND AMARIS 1050RS –
The evolutionary premium model

SCHWIND AMARIS 750S –
The powerful performance laser

SCHWIND AMARIS 500E –
The efficient compact model

Each model offers impressive precision and speed, which redefine perfection in refractive corneal surgery. This provides safety for you

and your patients, short treatment times, but also patient comfort and easy handling throughout the individual stages of treatment.

Additional benefits offered by the SCHWIND AMARIS product family as a whole include treatment planning modules for a very wide range of applications, and the facility to network all SCHWIND technologies for easy and secure data transfer.



»» The SCHWIND AMARIS technology fulfils a long list of requirements that are of fundamental importance to the eye surgeon.

Thomas Neuhann MD, EuroEyes ALZ Eye Clinic, Munich, Germany



Demanding users and patients need innovative solutions

The SCHWIND AMARIS® family is a fusion of functionality, high performance and safety

Patient expectations are constantly increasing with regard to treatment methods and the results attainable in corneal surgery. If you can offer the shortest treatment times with perfect results, you have the upper hand. This is where the SCHWIND AMARIS family of laser systems sets a new standard, delivering greater safety and patient comfort.

Innovative and reliable

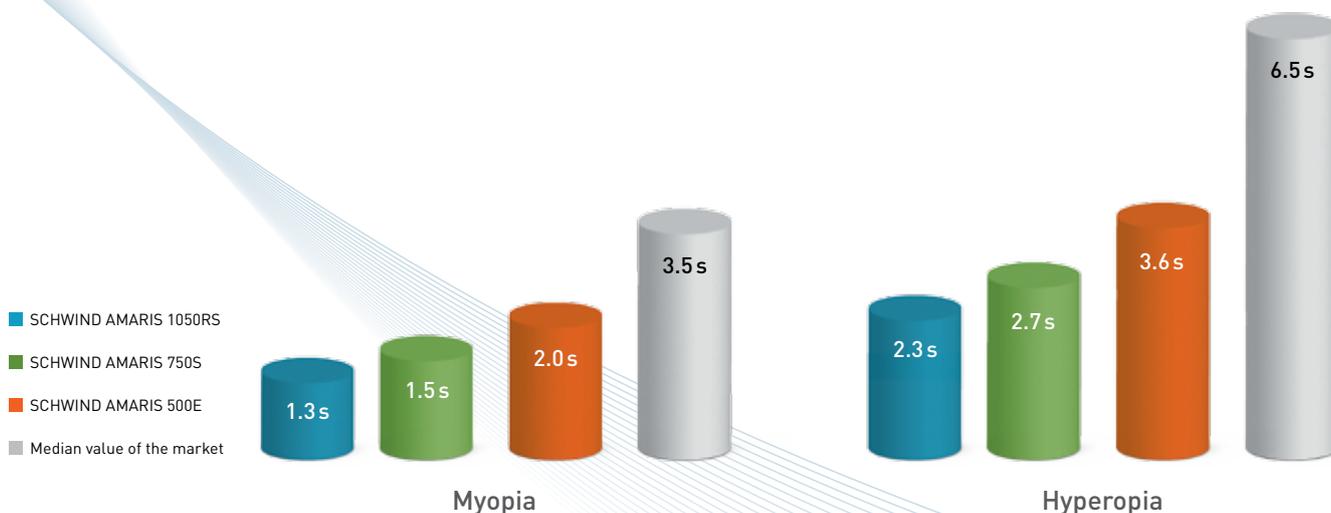
The SCHWIND AMARIS 1050RS is a new milestone in refractive corneal surgery, achieving a repetition rate of 1050 Hz, currently the highest of any excimer laser on the market. This innovative excimer laser decreases the extremely short ablation time of the product family even further, to 1.3 seconds per dioptre – the ablation times achieved with the AMARIS 750S and AMARIS 500E are no less impressive. In practical terms this means shorter treatment times and minimised risk of corneal dehydration. Moreover, the length of time the patient has to fixate on the green light is significantly shorter.

Whether 1050, 750 or 500 Hz, each of our laser systems is equipped with an extremely high-precision eye tracker, which compensates for eye movements in up to seven dimensions.

All the laser systems in the AMARIS family offer the combined advantages of tried and tested AMARIS technology – from Automatic Fluence Level Adjustment right through to Intelligent Thermal Effect Control. Contact-free online pachymetry enhances intraoperative safety. And the SCHWIND CAM software facilitates individual and tailor-made treatment planning. All these advantages add up to one thing in particular: safe and perfect results for your patients.


The clinical results with the SCHWIND AMARIS laser are the best I have ever seen.


Michiel Luger, MD, Bergman Clinics, Utrecht, Netherlands



SCHWIND AMARIS product family: ablation time per dioptre (s/D)*

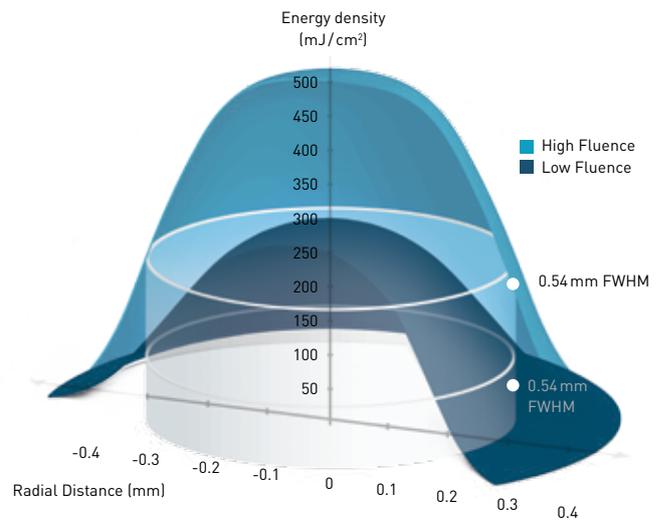
*without astigmatism, 12.5 mm vertex distance, 6 mm optical zone

AFLA

An ideal balance

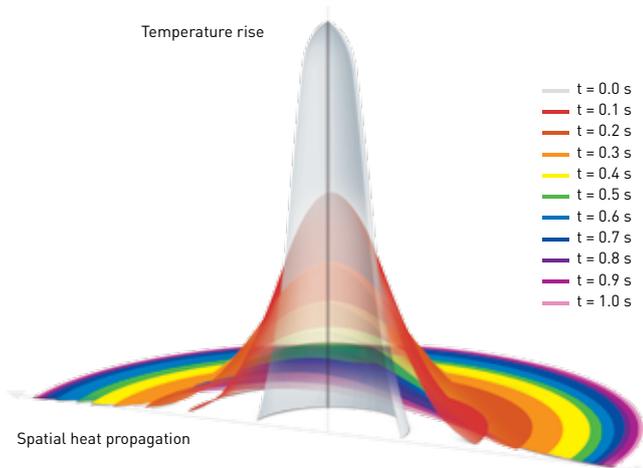
With the Automatic Fluence Level Adjustment (AFLA), the SCHWIND AMARIS product family achieves perfect smoothing of the cornea even at the highest ablation speed. Researchers at SCHWIND have developed an algorithm that ensures an ideally balanced ratio between the total number of laser pulses and the energy delivered.

About 80 percent of the ablation is performed with a high fluence value. For the fine modelling – the remaining 20 percent – AFLA automatically switches to a lower fluence. The result is optimum smoothing of the cornea. Through the extremely small beam size and Super-Gaussian beam profile, you achieve an exceptionally smooth ablation.

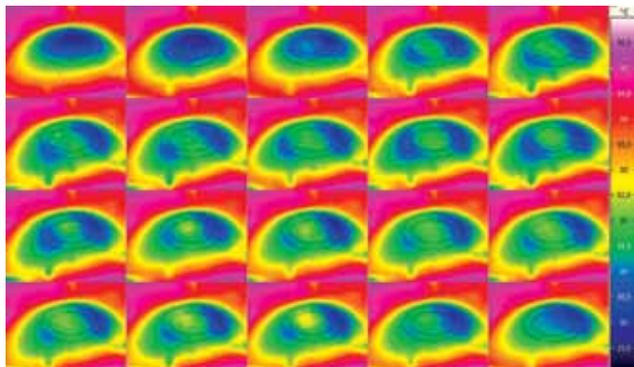


Automatic Fluence Level Adjustment

Ideal balance between the total number of laser pulses and energy delivered



Heat propagation of a laser pulse with the ITEC method



Corneal temperature measurements with an infrared thermographic camera

ITEC

Gentle even at the highest speeds

Intelligent Thermal Effect Control (ITEC) is the name of the thermal control process that prevents damage to the surrounding corneal tissue, even at the very high ablation speeds of the SCHWIND AMARIS product family. ITEC ensures that the laser pulses are distributed in a thermally optimised, dynamically adapted way, which gives the individual position on the cornea sufficient time to cool off. The following pulses can therefore approach an already cooled position faster. ITEC is clearly superior to the usual static processes. Studies using an infrared thermographic camera have proven that the corneal tissue only heats up minimally, even at high ablation speeds.

» The thermal control technology and ablation control with two fluence levels play a very important role, especially in biological terms: the less the biological interaction with the corneal tissue, the more reliably wounds can heal. «

Jorge Alió, MD, Visum Medical Ophthalmologic Corporation, Alicante, Spain

Safety in up to seven dimensions

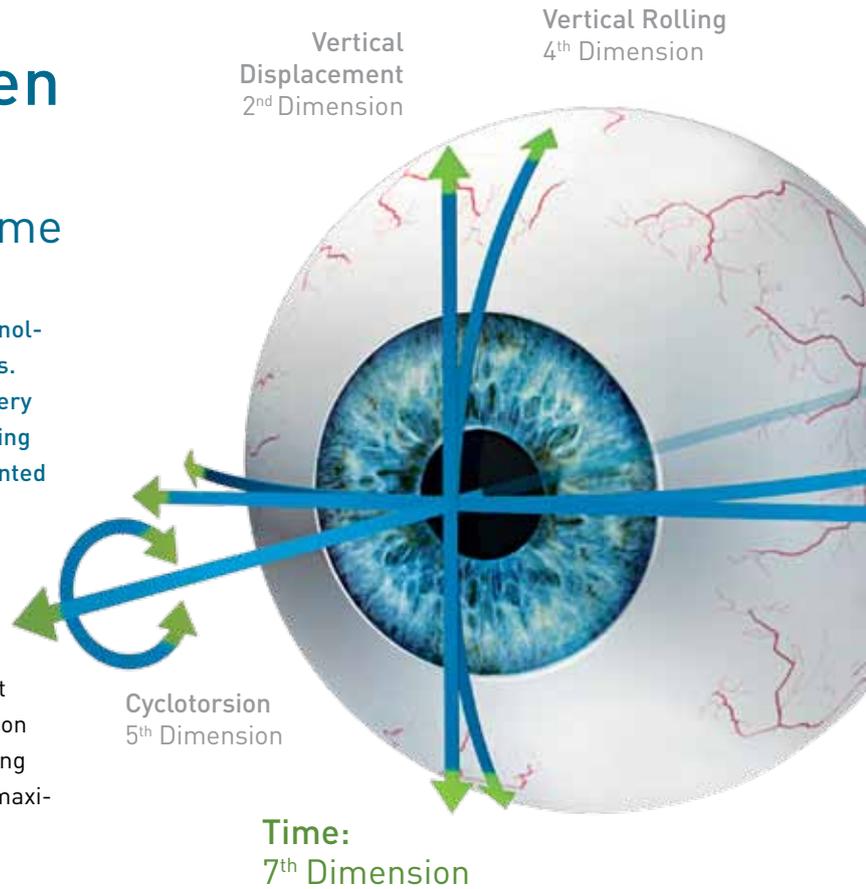
Eye tracking in space and time

Unsurpassed: the innovative SCHWIND AMARIS technology combines speed and precision in new dimensions. The 1050 Hz eye tracker actively compensates for every eye movement – in five to seven dimensions, depending on the AMARIS model – and offers you an unprecedented level of safety.

On average, the eyes move involuntarily 90 micrometres per millisecond in every direction, even during fixation. Consequently, precise centration and constant positioning of the eye is vitally important if high precision is to be achieved with eye laser surgery. The eye tracking features of the SCHWIND AMARIS technology ensure maximum safety.

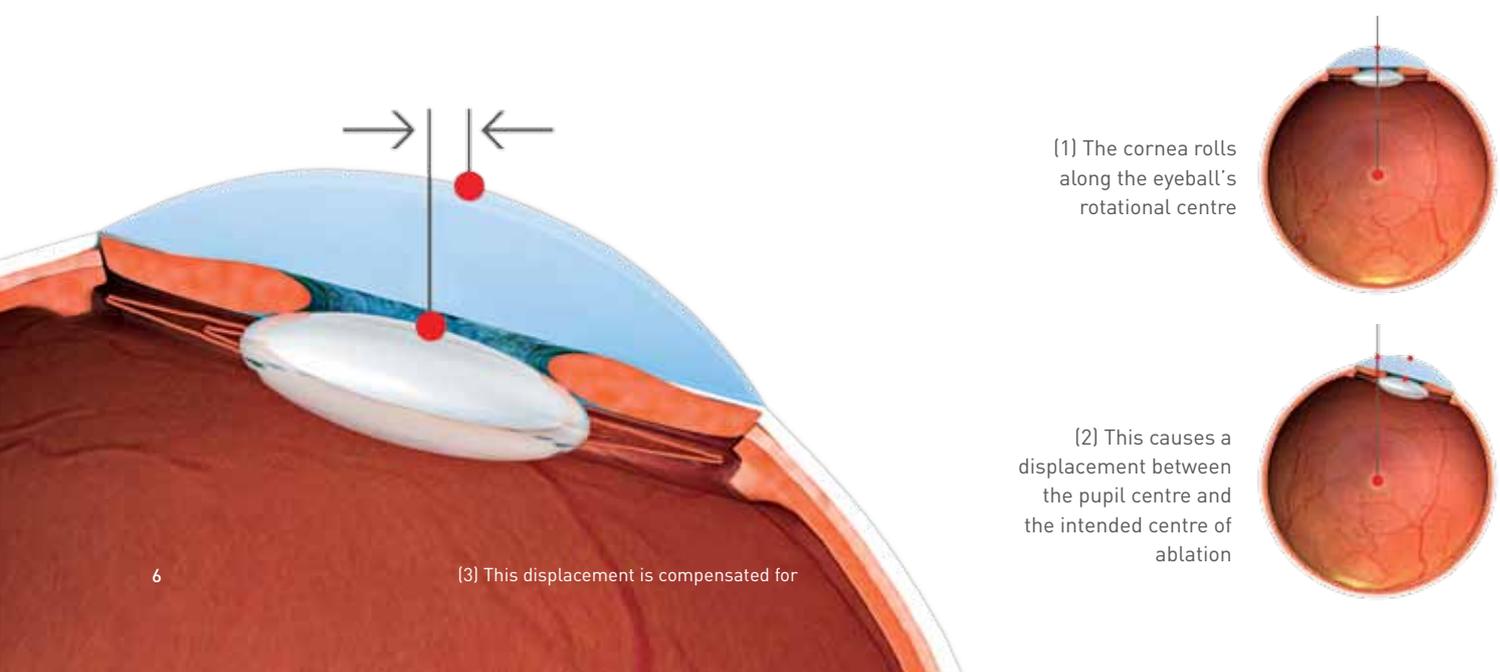
Compensation for eye movements in the 1st to 5th dimensions

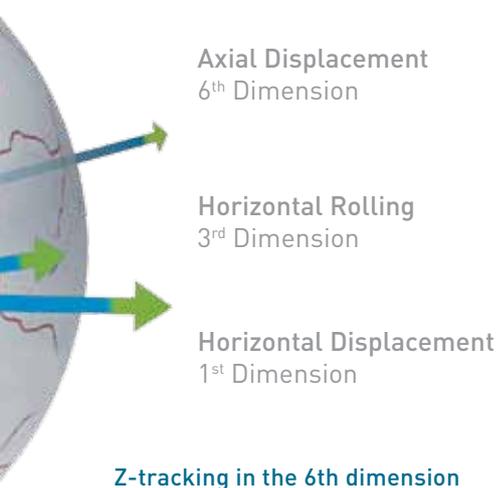
In addition to linear eye movements in the 1st and 2nd dimensions, the advanced eye tracker technology exactly detects and compensates for the horizontal and vertical rolling movements, i.e. the 3rd and 4th dimensions. In the 5th dimension, it compensates for static and dynamic



cyclotorsion, or in other words torsional differences between the upright and supine position of the patient as well as rotating movements of the eye during laser treatment.

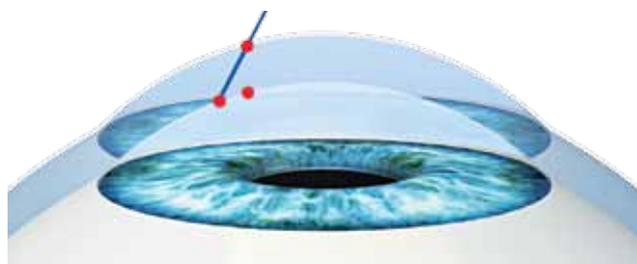
Compensation for rolling movements in the 3rd and 4th dimensions



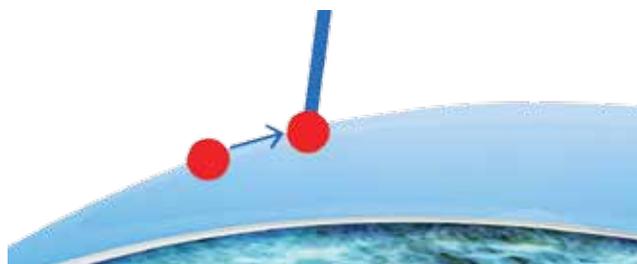


Z-tracking in the 6th dimension

Eye movements along the z-axis, i.e. the 6th dimension, result from the upward and downward movements of the head or the eyes. With z-tracking, the laser pulses are repositioned in order to actively compensate for positioning errors resulting from deviations along the z-axis.



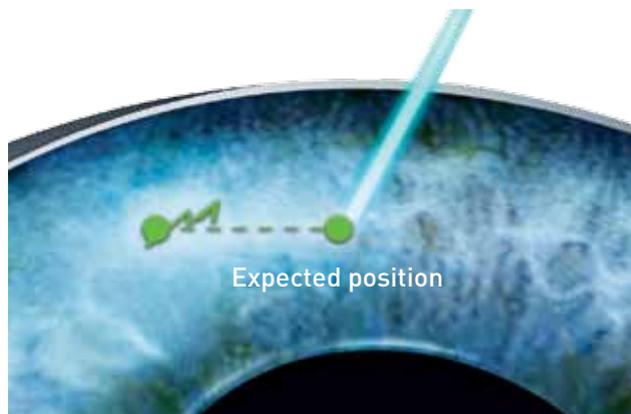
Positioning error along the z-axis



Repositioning of the laser pulses

Latency-Free Tracking in the 7th dimension

The new, ground-breaking Latency-Free Tracking considers the time factor, i.e. the 7th dimension. Latency-Free Tracking compensates for eye movements that occur in the period between acquisition of the eye-tracker image and triggering of the subsequent laser pulses. The eye tracker performs a motion analysis on the basis of previous eye positions during the treatment.



Latency-Free Tracking

It then calculates, for all six dimensions, where the corneal target position will be at the moment of the next two consecutive pulses. The scanner moves to this position before the next pulse is triggered. The laser system knows exactly when and where future laser pulses need to be triggered. The effect of this is latency-free ablation – and a perfect combination of speed and precision during the laser treatment.

Features for even more precision

The combination of many advantages in an innovative system makes the SCHWIND AMARIS technology the leading eye-tracking solution. This includes Pupil Centroid Shift Compensation. Simultaneously with pupil detection, the eye tracker also detects the limbus and considers the pupil shift under different light conditions. The advantage for the patient: decentration is prevented and no pupil-dilating medication is necessary prior to treatment. Automatic monitoring of the pupil size during static cyclotorsional control ensures additional safety. The illumination is automatically adjusted so that the pupil remains exactly the same size at the beginning of the treatment as it was at the preoperative examination.

Ideal conditions for a perfect outcome with maximum safety – something that only a technology leader is able to offer.

➤➤ **The main benefit of the AMARIS product family compared to other laser systems is the sophisticated eye tracking technology, which is highly efficient at tracking and compensating for the eye movements with unprecedented precision. As a result, patients rightly feel** <<< **more secure during their treatment.**

David Kang, MD, Eyereum Eye Clinic, Seoul, South Korea

1050 Hertz

7D Eye Tracking (Latency-Free Tracking)



The evolutionary premium model SCHWIND AMARIS® 1050RS

The SCHWIND AMARIS 1050RS is the product of continuous development work and is the most powerful excimer laser in the AMARIS product family. The innovative laser system delivers an unsurpassed repetition rate of 1050 Hz – currently the highest of all excimer lasers on the market – and consequently an extremely short ablation time of just 1.3 seconds per dioptre. That means even greater safety and comfort for the patient. The risk of the cornea drying out is minimised, and the length of time the patient has to fixate on the green light is reduced. It is a performance leap that brings maximum safety and enhanced patient comfort.

Active 7D eye tracking means that the SCHWIND AMARIS 1050RS combines space and time in an innovative technology without latency time.

The ground-breaking „Latency-Free Tracking“ takes account of eye movements occurring during the period between acquisition of the eye-tracker image and triggering of the subsequent laser pulses – thus, the new target position is known in advance. The ablation process without any latency error offers the patient even more precision.

The powerful performance laser

SCHWIND AMARIS® 750S

The SCHWIND AMARIS 750S offers high performance with optimal safety. The laser system ablates the cornea at two different fluence values, thereby achieving the perfect combination of speed and precision. A very fine laser spot, with a diameter of just 0.54 millimetres, ensures extremely smooth corneal modelling.

With a repetition rate of 750 Hz, the SCHWIND AMARIS 750S achieves very short treatment times. The 6D eye tracker takes 1050 measurements per second to monitor the exact

position of the eye in six dimensions. It actively compensates for any deviation with an ablation time of 1.5 seconds per dioptre.

More than three years of research and development have gone into this TotalTech Laser, and this is reflected in the perfect combination of tailor-made hardware and advanced software programs.

Numerous clinical publications testify to the excellent treatment outcomes with the SCHWIND AMARIS 750S.



750 Hertz

6D Eye Tracking (Z-Tracking)



500 Hertz

5D Eye Tracking (Advanced Cyclotorsion Control)

The efficient compact model

SCHWIND AMARIS® 500E

The SCHWIND AMARIS 500E perfectly combines efficiency and safety. Automatic Fluence Level Adjustment (AFLA) ensures an optimal balance between the total number of laser pulses and the energy delivered. The result is fast ablation with optimum smoothing of the cornea. The laser system, with a 500 Hz repetition rate, is perfectly complemented by a 5D eye tracker, which actively compensates for eye movements in five dimensions. Contact-free online

pachymetry measures the thickness of the cornea throughout the entire duration of the laser treatment, and increases intraoperative safety in refractive surgery.

The SCHWIND AMARIS 500E is trusted by eye surgeons, and the outstanding performance of this compact laser system is verified by numerous studies.

Differences at a glance



AMARIS® 1050RS



AMARIS® 750S



AMARIS® 500E

Laser Parameters			
Repetition rate	1050 Hz	750 Hz	500 Hz
Ablation time (s/D) (Myopia, without astigmatism, 12.5 mm vertex distance, 6 mm optical zone)	1.3 s	1.5 s	2.0 s
Eye Tracker (basic version 4D)	7D maximum	6D maximum	5D maximum
Reaction time (system as a whole)	Zero latency (with Latency-Free Tracking)	3 ms	3 ms
6 th dimension: Z-tracking	Optional	Optional	-
7 th dimension: Latency-Free Tracking	Optional	-	-
Design/Features			
Base unit	Design base, high-gloss paint finish	Design base	Functional base
Laser arm	90° swivelling	90° swivelling	-
Dimensions (L x W x H) including patient bed	2634 mm x 1443 (±50) mm x 1418 mm	2634 mm x 1443 (±50) mm x 1418 mm	2265 mm x 1486 (±50) mm x 1411 mm

The right decision – whichever model you choose

The SCHWIND AMARIS® product family in the HQ Index



We have developed an index which allows systematic and objective comparison of the excimer laser systems on the market.

The HQ Index is based on the following technical parameters:

$$HQ-Index = \left[\frac{RepetitionRate \cdot SamplingRate \cdot (StaticDim + DynamicDim)}{BeamDiameter \cdot TreatmentTime} \right]^{1/2}$$

HQ Index

	SCHWIND AMARIS® 1050RS	SCHWIND AMARIS® 750S	SCHWIND AMARIS® 500E	Median of the Market Systems	Maximum Achievable Value
■ Eye Tracking (Dynamic Dimensions) ³	7	6	5	4	7
■ Eye Tracking (Static Dimensions) ²	3	3	3	3	3
■ Eye Tracking Rate (Hz)	1050	1050	1050	1050	1050
■ Treatment Time (s/D) ¹	1.3	1.5	2	2	1.3
■ Beam Diameter (mm)	0.54	0.54	0.54	0.61	0.54
■ Pulse Rate (Hz)	1050	750	500	500	1050
HQ Index (including all parameters)	250	206	157	144	250

¹ Treatment time corresponds to myopic treatments without astigmatism, in 6 mm optical zone, at a vertex distance of 12.5 mm and with maximum fluence values

² Static dimensions correspond to the number of registered dimensions from diagnosis (Maximum value 3 = X-pupil, Y-pupil, and static cyclotorsion)

³ Dynamic dimensions correspond to the number of registered dimensions during ablation (Maximum value 7 = X-pupil, Y-pupil, X-roll, Y-roll, Z-movements, dynamic cyclotorsion, and latency)

Perfection in form and function

Intelligent design for a new dimension in quality

The SCHWIND AMARIS 1050RS will enhance your clinic in every respect – with its elegantly curved lines, shiny white paintwork and blue accents.

The successful integration of complex ergonomic and technical specifications with attractive design is also exemplified by the SCHWIND AMARIS 750S, while the SCHWIND AMARIS 500E is the efficient solution with its compact and ergonomic functional base unit.

We aim to create laser systems which meet the highest demands, both aesthetically and in terms of performance, and which do their job to perfection, day in, day out. All the controls are easy to reach and clearly laid out to ensure that you can concentrate fully on the treatment of your patients.

But, of course, design and ergonomics are not the only things that really make our laser systems stand out. Throughout the entire development process in accordance with DIN EN 62366, we constantly keep usability in mind. Combined with comprehensive quality assurance at every stage of production, this ensures extremely high operational safety, low maintenance requirements and a long lifespan, no matter which model you choose.



Swivelling patient bed



Swivelling laser arm

Attention to detail makes the difference

The convenient 90° swivelling laser arm on the AMARIS 1050RS and 750S models facilitates the preparation of the patient, as well as the use of other medical devices.

Another very useful feature of all the AMARIS models is a motorised swivelling patient bed, which allows further stages of surgery without having to change the patient's position.

The touch screen enables simple software operation. The monitor can be adjusted in every direction – making it easy for your assistant to work with. An additional display in the surgeon's field of view always shows the most important information.



➤
 The controls are easy to reach and can be operated conveniently.
 ➤

Maria Clara Arbelaez, MD, Muscat Eye Laser Center, Muscat, Oman

Our high-end microscope was specially developed for TotalTech Laser technology and delivers excellent contrast, true colour brilliance and exceptional spatial vision.

The diagnostic slit lamp for flap checking is compact in design and can be swivelled around two axes across the entire working area.

The integrated slit lights enable you to monitor the exact positioning of the patient's eye. You can detect any tilting or decentration of the eye and easily adjust the position accordingly.

The free working distance between the laser arm and patient's eye is a generous 193 millimetres. The benefit for you is convenient and safe working with the microkeratome.

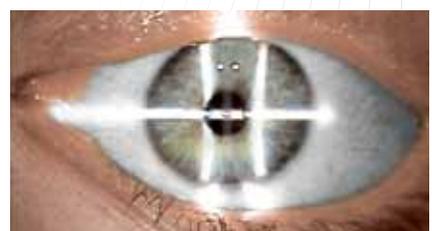
Flushing the beam path with additional nitrogen can be dispensed with because the laser beam is passed through a vacuum within the system.



Height adjustable high-end microscope



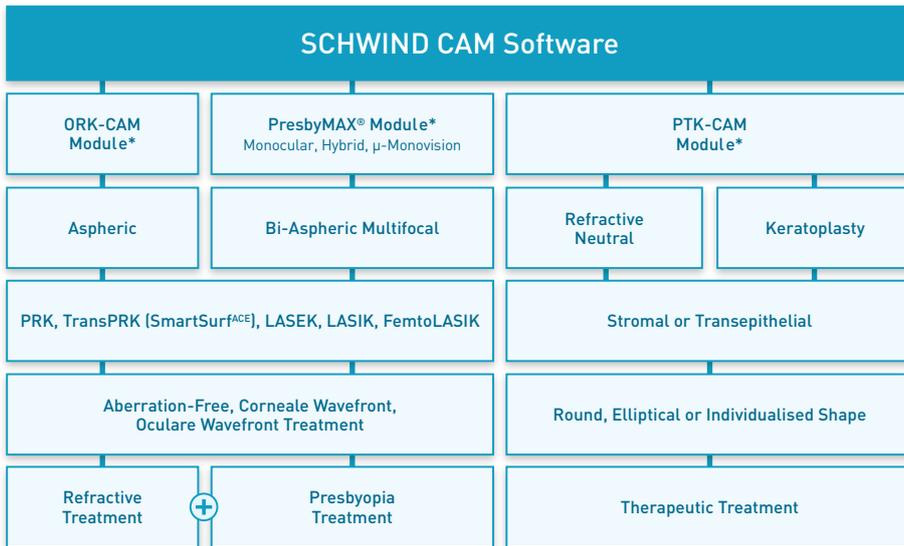
Diagnostic slit lamp



Integrated slit lights

Plan individually for each situation

Comprehensive treatment planning with complete diagnostic data

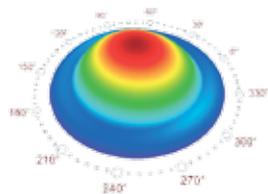


* with Static Cyclotorsion Control

Each treatment is different. That is why the entire AMARIS product family, with the modular SCHWIND CAM software, makes it possible for you to plan treatment individually for your patients across an exceptionally wide range of applications in corneal surgery. Whether corneal or ocular wavefront or corneal pachymetry, all the required diagnostic data are incorporated into planning.

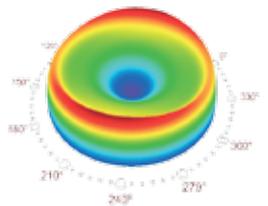
You can be sure that you will not leave out any detail important for the individual ablation.

SCHWIND CAM modules and the advantages for you



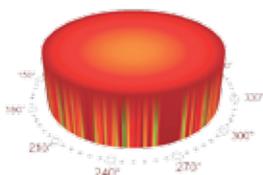
ORK-CAM:

A one-of-a-kind intelligent planning tool for wide-ranging and tailor-made refractive laser treatment. Aspheric ablation profiles are employed for both aberration-free and customised treatments based on corneal or ocular wavefront data.



PresbyMAX®:

This module is ideal for safe and efficient treatment of patients with emmetropia, myopia, hyperopia and astigmatism, whose accommodative response is limited. PresbyMAX is based on bi-aspheric, multifocal ablation profiles.

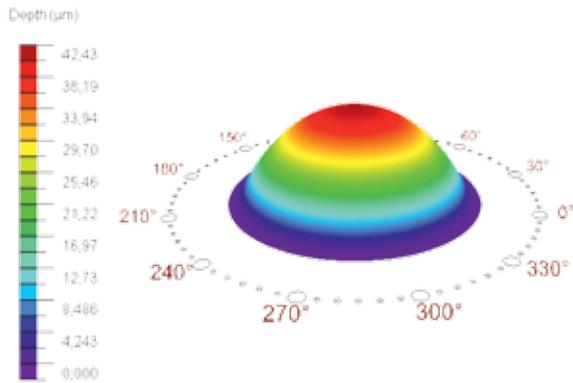


PTK-CAM:

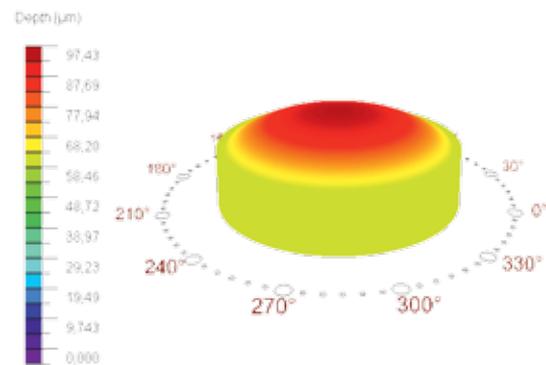
This module supports you in performing therapeutic treatments. Superficial as well as deep corneal scars and corneal degenerations can be exactly localized and treated with a procedure in which the corneal tissue is ablated in either a circular, elliptical or an individualised shape. You can choose between a more superficial refraction-neutral or a deep ablation for performing keratoplasty.

Touch-free treatment with SmartSurf^{ACE}

Innovation that delivers results



PRK profile in myopia treatment



SmartSurf^{ACE} profile in myopia treatment

SmartSurf^{ACE} combines the benefits of touch-free TransPRK surface treatment with innovative SmartPulse Technology.

It works without touching the eye. There is no suction, no blade and no incision – vision is precisely corrected through the top layers of the cornea with SCHWIND AMARIS technology, gently, touch-free, in a single step. SmartSurf^{ACE} corrects refractive errors by superimposing an aspheric ablation profile with a defined epithelial thickness profile.

The advantages over other surface treatment methods are obvious – the epithelium is removed more precisely, more uniformly and more easily than with manual or alcohol-assisted debridement. With regular corneas, treatment with SmartSurf^{ACE} speeds the healing process over other surface treatments. Good vision quality is achieved significantly earlier, even in high myopic eyes.

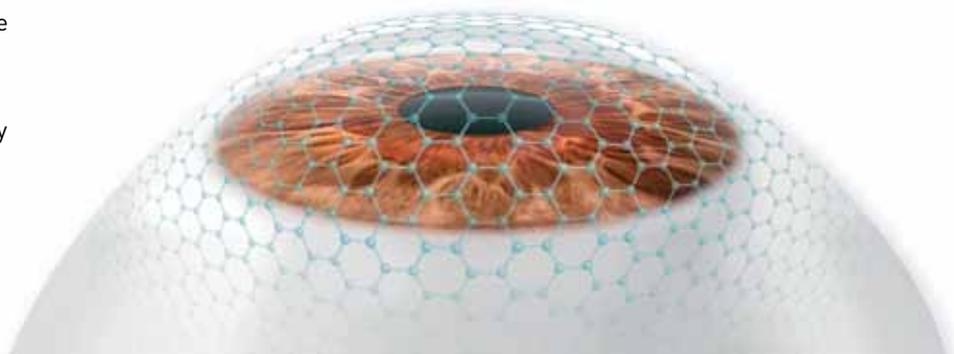
SmartSurf^{ACE} is suitable for any laser candidate as well as patients with thin corneas, corneal pathologies or complex topographies.

Very smooth cornea

For the AMARIS laser, the geometric corneal model, the ablation pulse and the pulse distribution were optimised based on extensive research.

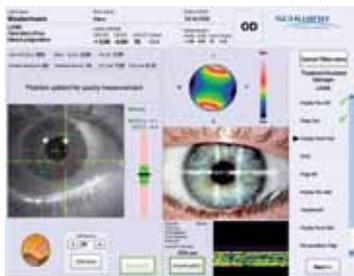
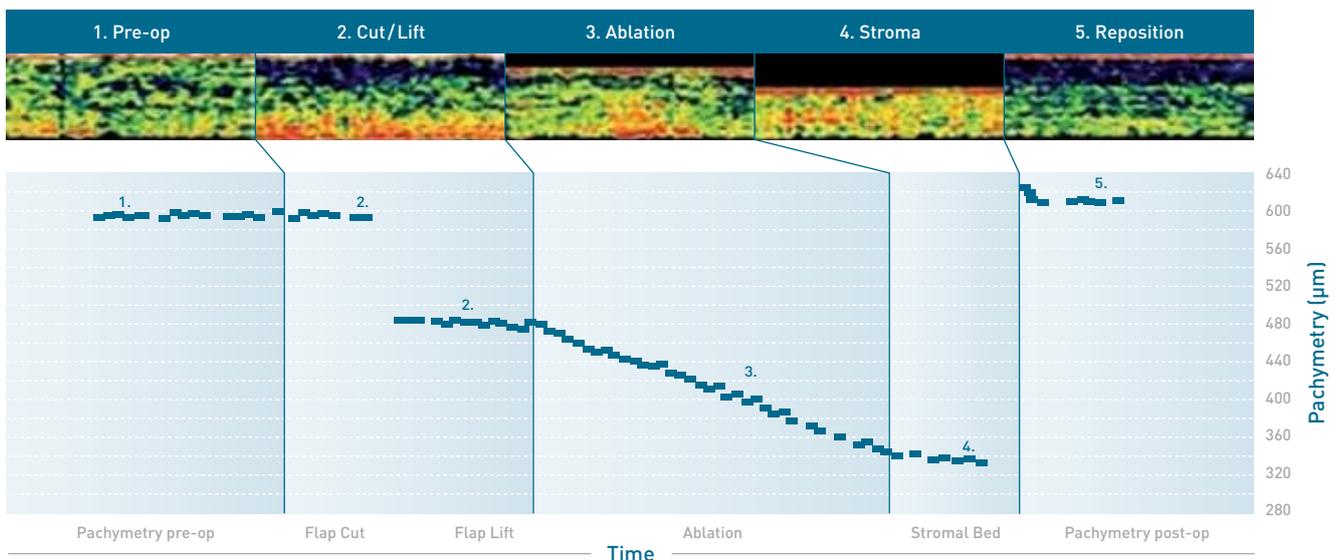
The result: the innovative SmartPulse Technology improves vision quality in the early postoperative phase of all treatment methods. Surface treatments as SmartSurf^{ACE} benefit in particular, since a LASIK flap does not contribute to smoothing of the stromal surface until it regenerates.

A 3D fullerene model is used to give a very accurate depiction of the cornea



High-resolution online pachymetry

Continuous corneal thickness measurement means enhanced safety



The integrated, contact-free online pachymetry provides you with precise information about the thickness of the cornea throughout the entire duration of the treatment. The changes are measured and displayed on the treatment screen online. The measurements are taken before the flap is prepared, after the flap is lifted as well as during and after laser treatment. This ensures that you always know exactly how much you have already ablated and how thick the remaining cornea actually is, which increases the in-traoperative safety in refractive treatments. All the data and procedures are documented in the treatment log. (Illustration above: Real-time change in corneal thickness.)

Greater corneal stability

Corneal collagen crosslinking with CXL-365 vario

All laser systems in the SCHWIND AMARIS product family offer the option of integrating an innovative UV lamp, the SCHWIND CXL-365 vario system. This enables you to carry out corneal collagen crosslinking (CXL) easily and conveniently at the workplace of your laser system. The precise X/Y adjustment of the patient bed makes it very easy to position the patient.

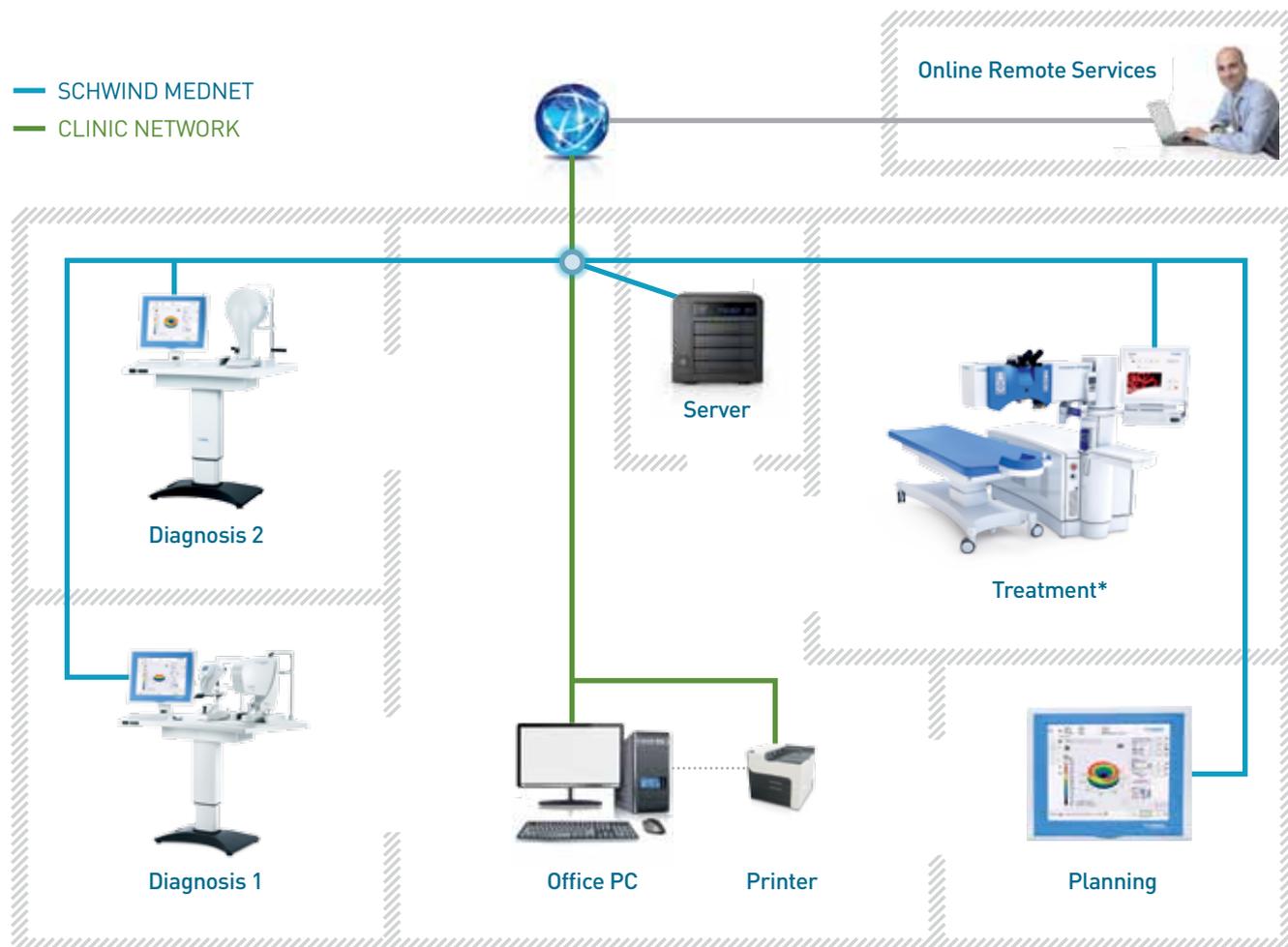
The SCHWIND CXL-365 vario system features three power settings and a continuously adjustable aperture. The highest power setting enables deep crosslinking within five minutes, and the UV beam can be positioned precisely on



the cornea. The display shows you the remaining treatment time. Integration of the SCHWIND CXL-365 vario into the SCHWIND AMARIS product family represents another ground-breaking development, which delivers high efficiency and ease of operation for you. For your patients it means gentle and safe treatment.

Fully networked clinical reliability

SCHWIND MEDNET – the network solution for efficient, secure and convenient data management



Greater patient focus, optimised efficiency and avoidance of medical risks – these are the challenges to be met in daily clinical practice. We support you in achieving your goals with the SCHWIND MEDNET, an innovative, standardised network solution.

SCHWIND MEDNET combines the SCHWIND technologies used in your clinic consistently and securely. All the data you generate with our diagnostic devices and laser systems, is stored centrally and can be called up and processed simply and conveniently from any SCHWIND MEDNET workstation. The time-consuming use of removable storage media such as SD cards and USB sticks is consigned to the past. Clinical procedures are made more efficient, and you are free to concentrate wholly on your patients. SCHWIND MEDNET seamlessly

incorporates with your existing IT infrastructure. The intelligent SCHWIND MEDNET Manager software ensures secure and consistent data transfer and makes for easier network administration.

Support, training and advice are provided by our application and service specialists via the SCHWIND Online Remote Services. Upon request, all the integrated systems can be checked using remote access and files can be downloaded from your system for analysis. This instant assistance saves you time and minimises the service and maintenance effort.

*not with PALK-CAM

SCHWIND AMARIS® Product Family

	AMARIS® 1050RS	AMARIS® 750S	AMARIS® 500E
Laser Parameters			
Repetition rate	1050 Hz	750 Hz	500 Hz
Intelligent Thermal Effect Control	✓	✓	✓
SmartPulse Technology	✓	✓	✓
0.54 mm beam size, Super-Gaussian profile (FWHM)	✓	✓	✓
Beam delivery – flying spot with Automatic Fluence Level Adjustment	✓	✓	✓
Eye Tracking Features			
1050 Hz sampling rate	✓	✓	✓
Latency time of laser system	Zero latency (with Latency-Free Tracking)	3 ms	3 ms
Pupil and limbus tracking: Pupil Centroid Shift Compensation, Automatic Pupil Size Control	✓	✓	✓
Eye Tracking Dimensions			
1 st and 2 nd dimensions: Compensation of lateral movements	✓	✓	✓
3 rd and 4 th dimensions: Rolling balance	✓	✓	✓
5 th dimension: Advanced Cyclotorsion Control – static (option), dynamic	✓	✓	✓
6 th dimension: Z-tracking (option)	✓	✓	-
7 th dimension: Latency-Free Tracking (option)	✓	-	-
SCHWIND CAM Software			
ORK-CAM module: Refractive treatment	✓	✓	✓
PresbyMAX module: Presbyopia treatment (per procedure fee)	✓	✓	✓
PTK-CAM module: Therapeutic treatment (keratoplasty as option)	✓	✓	✓
Ergonomics			
90° swivelling laser arm	✓	✓	-
Up to 90° swivelling patient bed (optional motor drive)	✓	✓	✓
Panel PC – touch screen monitor, pivotable on 2 axes, additional dot-matrix display, washable keyboard with integrated touchpad	✓	✓	✓
Working distance of 193 mm	✓	✓	✓
Further Features			
Online pachymetry (option)	✓	✓	✓
Diagnostic slit lamp – swivelling on 2 axes, 4 selectable diaphragms (option)	✓	✓	✓
SCHWIND CXL-365 vario for corneal collagen crosslinking (option)	✓	✓	✓
Integrated video recording (optional)	✓	✓	✓
Cross laser for patient adjustment (option)	✓	✓	-
SCHWIND MEDNET network solution (option)	✓	✓	✓

Compliance: CE conformity in accordance with Medical Device Directive (MDD) 93/42/EEC

Optimum functionality, reliability and compliance with all legal regulations can only be assured through the use of products supplied by SCHWIND – whether as single items or as a combined system.