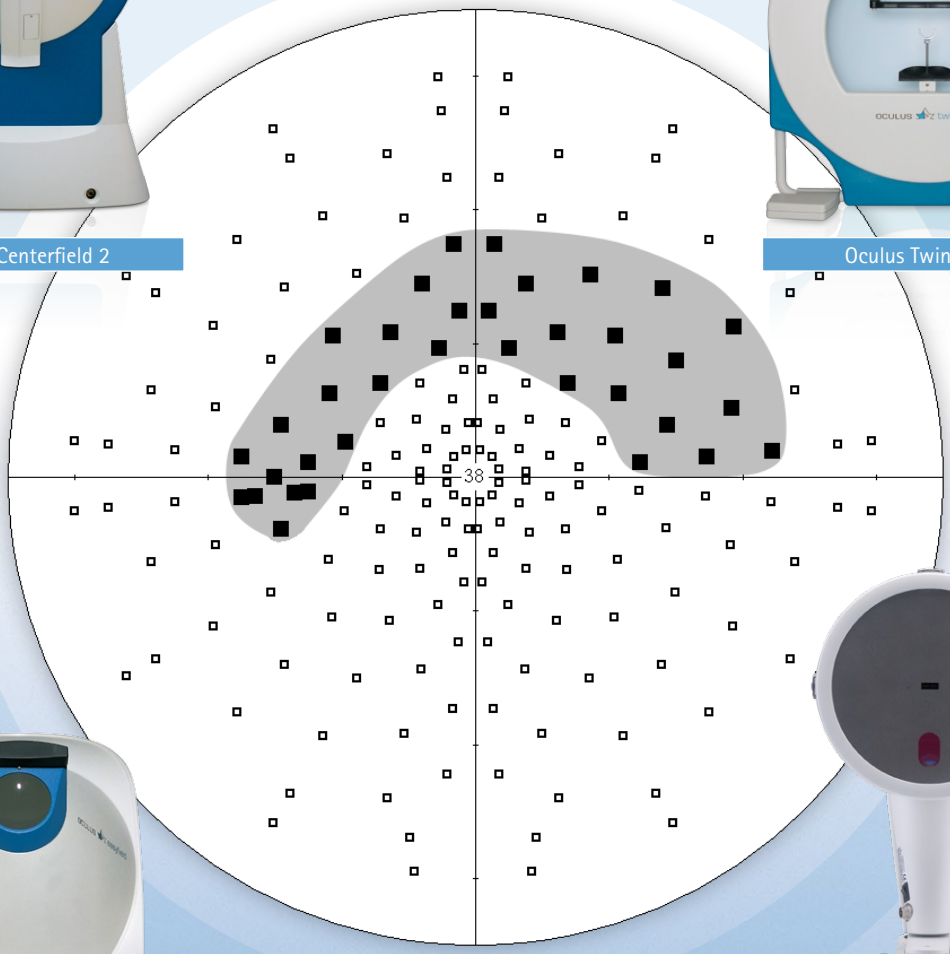
DETECTING GLAUCOMA AND RISKS

Oculus Centerfield 2

Oculus Twinfield 2



Oculus Easyfield

Oculus Pentacam

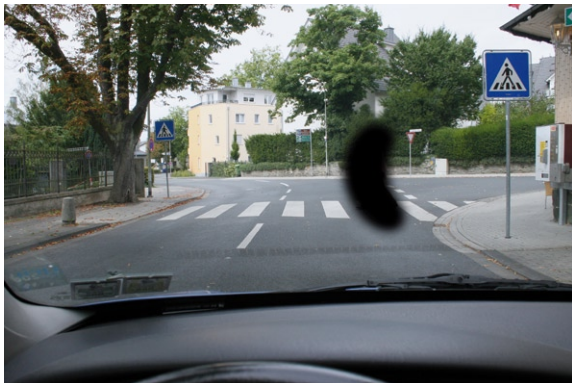
OCULUS®

We focus on progress

What does Glaucoma mean to y

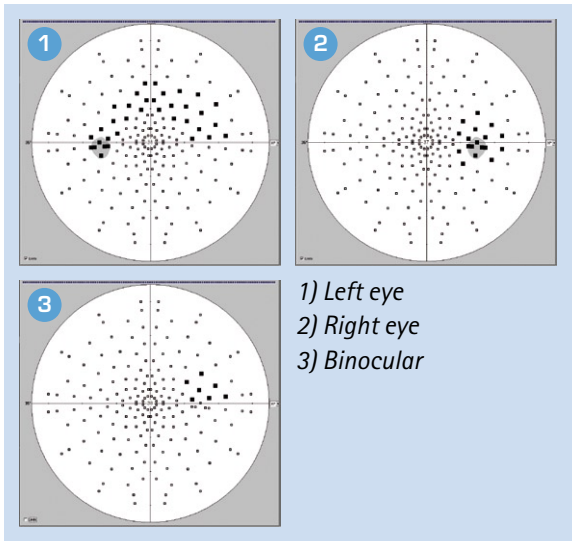
You don't see your own Scotoma!

The normal driver's view



Common textbook illustration of a glaucomatous field defect

The patient's view: no apparent scotoma



Perimetry reveals an arcuate nerve fiber bundle defect OS and blind spot enlargement OD

Monocular field defects are compensated by the fellow eye. Overlapping zones of right and left eye scotomas are masked by fitting in surrounding visual information. The patient remains unaware even of the binocular scotoma – and of the pedestrian! Scotomas (excepting central ones) are clandestine threats which do not show up in consciousness. Perimetry is the unique and essential tool to detect scotomas – and to prevent hazards from patients and increase traffic safety.

ou?

A look ahead

By the year 2020, an estimated 80 million people worldwide will have glaucoma, and 11 million of them will be blind in both eyes.

Patients are at risk for significant damage to the optic nerve before noticing problems with their eyesight. As such, prevention becomes key and practitioners are being urged to encourage patients to 'know their risks' and be screened for glaucoma.

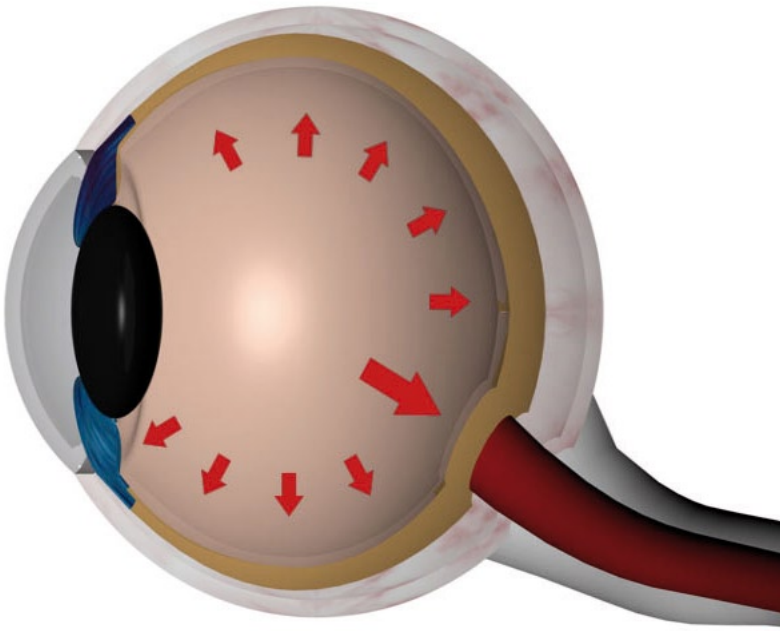
Known as the "sneak thief of sight," glaucoma is a disease characterized by a gradual loss of vision resulting from the death of the cells in the eye – the optic nerve cells – which transmit visual images through the optic nerve to the brain.

As the optic nerve becomes increasingly damaged, progressive vision loss and eventually blindness can occur. Early detection is the key to treating and halting the effects of glaucoma, but current worldwide estimates reveal that more than half of glaucoma sufferers do not even realize they have the disease.[1)]

"When glaucoma is detected early and appropriate treatment is instituted, 90% of the blindness from glaucoma could be eliminated," said Dr. Robert Ritch, Professor and Chief of Glaucoma Services New York Eye and Ear Infirmary and Co-Chair of the World Glaucoma Association (WGA) and World Glaucoma Patient Association (WGPA) Physician Liaison Committee.

There are several known risk factors for glaucoma, which include increasing age, family history of glaucoma, African and Chinese ancestry, nearsightedness, high blood pressure and elevated eye pressure (also known as elevated intraocular pressure or IOP)[2)]. Of these, IOP is currently recognized as the only modifiable risk factor for glaucoma. Lowering IOP in glaucoma's early stages offers the best chance of preserving vision.

"Accurate diagnosis and appropriate treatment of glaucoma can prevent damage to the optic nerve and preserve healthy vision, which is why comprehensive checkups that include eye pressure measurements and careful evaluation of the optic nerve are so important," said Dr. Ivan Goldberg (Sydney, Australia), Immediate Past WGA President and Co-Chair of the WGA/WGPA Physician Liaison Committee. "Since vision loss from glaucoma is permanent, glaucoma needs to be diagnosed and treated as early as possible," said Dr. George Lambrou (Athens, Greece), Global Project Leader for the World Glaucoma Day and Executive Vice-Chair of the WGA/WGPA Physician Liaison Committee.



→ *Increased intraocular pressure can lead to optic nerve damage and visual field loss.*

Oculus is a sponsor of World Glaucoma Association, www.worldglaucoma.org

1) Tielsch JM, Sonimer A, Katz J, Royall RM, Quigley HA, Javitt J. Racial variations in the prevalence of primary open-angle glaucoma: The Baltimore Eye Survey. JAMA 1991;266:369-74.

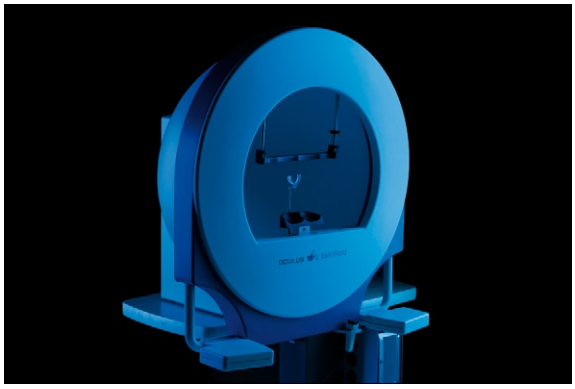
2) The Glaucoma Foundation. Who's at Risk? Available at: http://www.glaucomafoundation.org/risk.htm. Accessed on August 24. 2007.

WE HAVE IT ALL!

From early glaucoma detection to long-term management

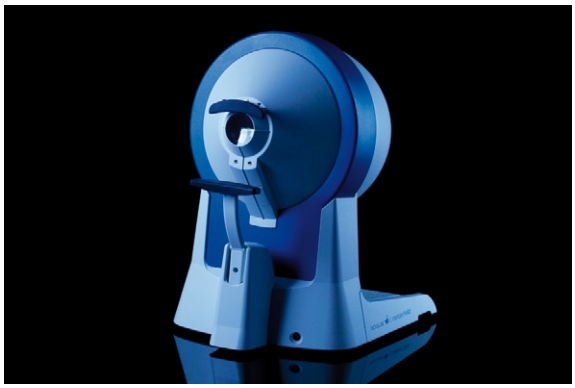
The Pentacam

The Pentacam is a Scheimpflug camera which captures Scheimpflug images during a rotating scan and calculates a 3D model of the anterior eye segment.
Important parameters such like chamber depth, 360° chamber angle, pachymetry and lens densitometry are calculated automatically. It's automatic alignment systems accounts for easy operation and repeatable results.



The Twinfield 2

The Twinfield 2 combines all measurement principles (static and kinetic) in one device. It tests the whole visual field up to 90°. This perimeter is optimized for daily use in clinical routine and medical practices, performing screening and threshold examinations, follow-up programs and statistical analysis of the results.



The Centerfield 2

The Centerfield 2 is the only compact perimeter able to perform examinations up to 70°. The self-contained measurement system warrants examinations largely independent of ambient illumination. Therefore, perimetry no longer needs to be carried out in an absolutely dark room.

The Easyfield

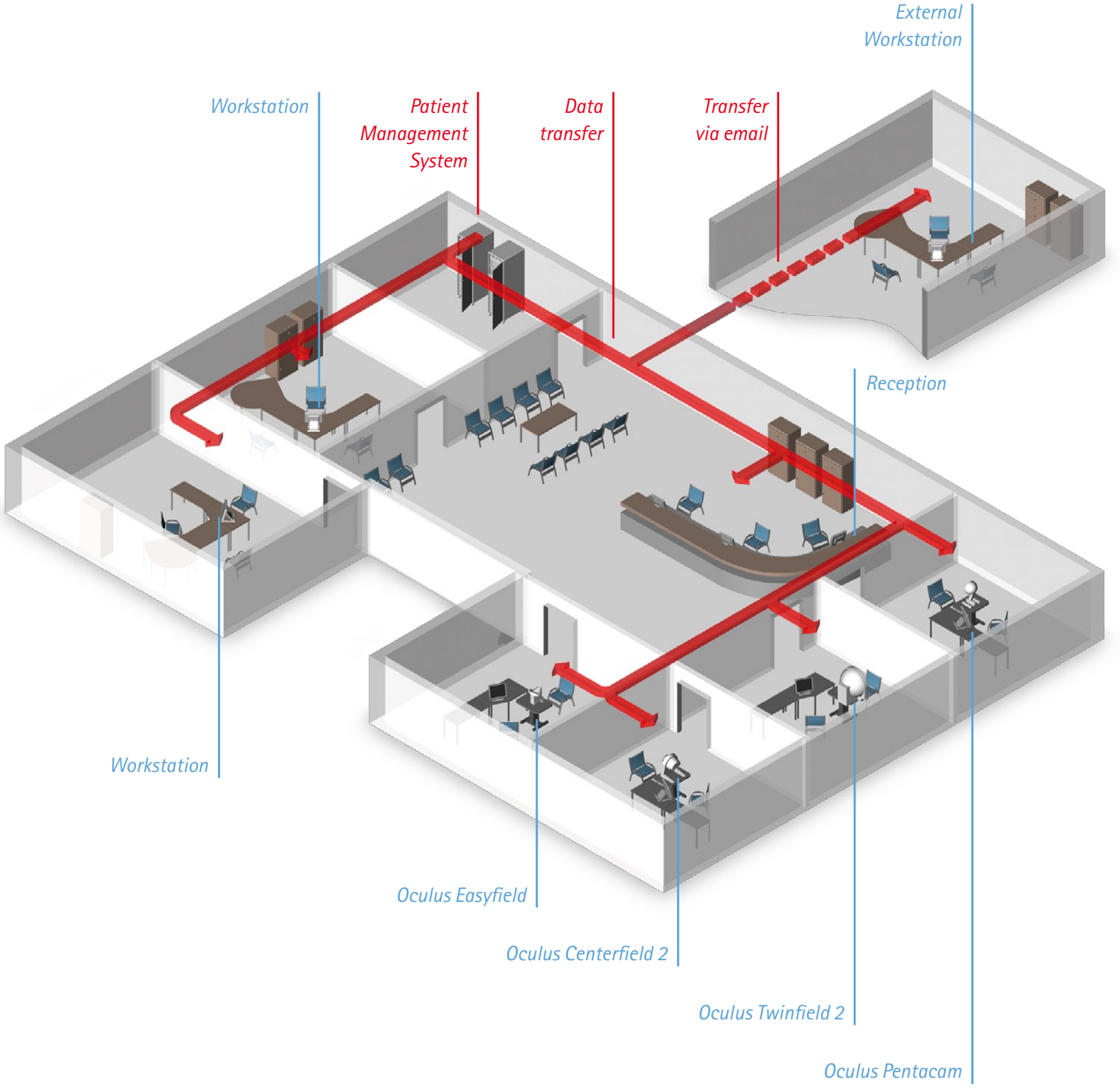
The Oculus Easyfield is an exciting compact perimeter to carry out static perimetry up to 30°. It has been designed for the combined use as a visual field screener and perimeter, offering many features usually available only in large units.

YOUR OFFICE NETWORK

Practice efficiency and more time for patient care

Connect your Oculus device directly to your office network. All Oculus devices use their own common patient management system by default. But if you prefer to continue using your familiar management system, integration of Oculus software can be easily performed.

System integration enables an easy synchronizing of your instruments, eliminates manual data entry and data retrieval, while minimizing paper handling.



THE PENTACAM

The Gold Standard in Anterior Segment Tomography

The Pentacam provides automatic evaluation of the anterior eye segment, from the anterior corneal surface to the posterior lens surface using a rotating Scheimpflug camera. The non-contact measuring process takes only 2 seconds and performs up to 50 single captures. In total, up to 138.000 true elevation points are detected and processed to a 3D model of the anterior eye segment.

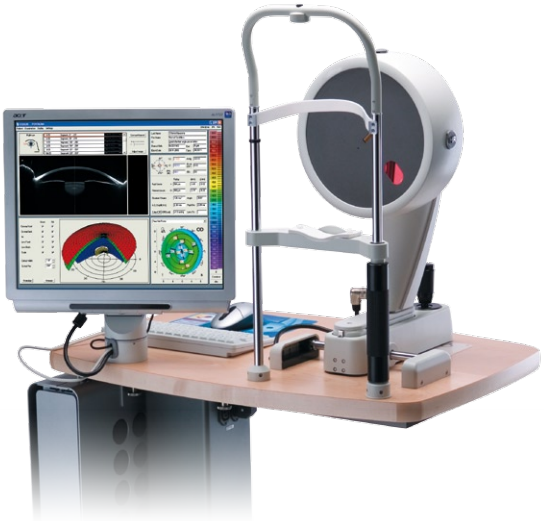
The key advantages of the rotating imaging process are:

- precise measurement of the whole cornea,
- correction for eye movements,
- easy fixation for the patient,
- easy and intuitive operation,
- extremely short examination and processing time.

There are several evaluation modules available, such as:

- Scheimpflug tomography,
- 3D chamber analysis (chamber depth, angle and volume),
- pachymetry (including correction of the intraocular eye pressure [IOP]),
- densitometry of the crystalline lens and IOL,
- corneal topography including anterior and posterior corneal surface,
- unique Keratoconus detection based on topography and pachymetry.

The Pentacam is an ideal instrument for quick glaucoma screening with automatic evaluation software and is the perfect analyzer for corneal refractive surgeons.



How may a Glaucoma screening look in practice?

Imagine you see a 45 year old patient. You do a routine refraction and measure the IOP. The patient is mildly myopic. IOP raw reading is 19 mmHg by applanation tonometry. You also perform a Pentacam exam and obtain the following information, which are automatically displayed on the Pentacam screen in your office:

- Scheimpflug image with an obvious shallow chamber
- corneal thickness of 487µm
- ACD of 2.72 mm
- anterior chamber volume (ACV) of 105 mm³
- anterior chamber angle (ACA) of 23.6°.

You know immediately the true IOP is most probably higher than measured with the tonometer. The Pentacam IOP correction table based on pachmetry confirms this and displays a corrected IOP of 23.1mmHg.
Considering the patient's age of 45 years with, a family history of narrow angle glaucoma, you may want to obtain further information about the condition of the optic nerve using the Oculus Twinfield perimeter to perform a pre-programmed Glaucoma screening test.

What does it mean to your patients?

Patients who often do not have a medical background, experience the Pentacam as very educational and informative. For example, it makes narrow-angle glaucoma easy to understand and not only shows corneal thickness clearly, but also presents a three-dimensional view of the anterior eye segment.

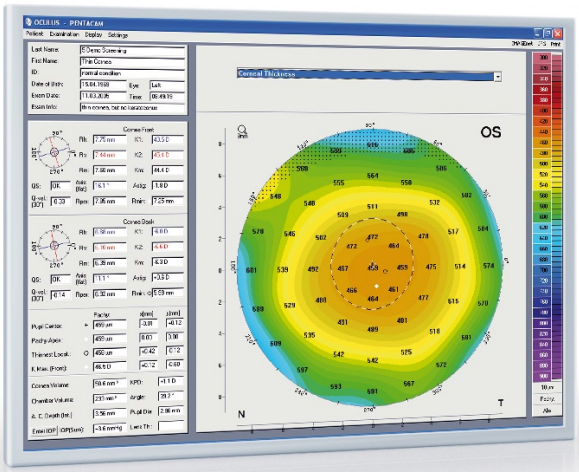
Easy and Quick Glaucoma Screening

Pachymetry

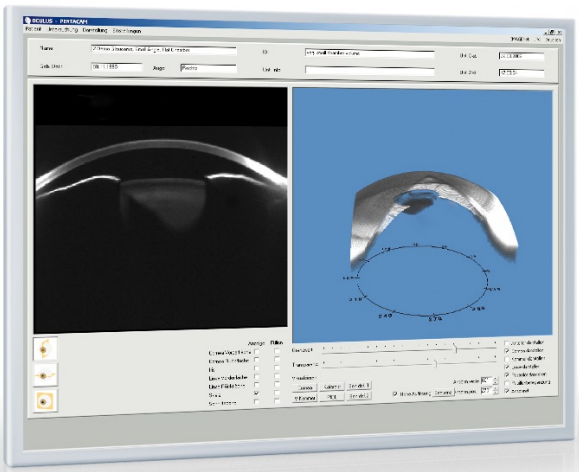
The corneal thickness is displayed as a colored map over its entire area from limbus to limbus.
Each single location can be individually evaluated by a mouse click. Additionally the measured IOP can be corrected with regard to corneal thickness.

Furthermore important points are displayed in values and locations, such as:

- pupil center thickness
- corneal apex thickness
- thinnest location
- corneal volume



3D Chamber Analyzer



The Scheimpflug image itself gives an initial impression about the anterior chamber conditions. One can immediately notice a shallow chamber. Moreover the software automatically calculates and displays important parameters, such as:

- chamber angle
- chamber volume
- chamber depth

You may want to check biometric parameters after iridotomy or iridectomy. The changes in the anterior chamber are visible immediately after surgery and can be measured manually:

- in the Scheimpflug images,
- in the ACV and ACD value,

This allows an easy documentation as well.

The Pentacam Tomographer displays a virtual model of any individual anterior eye segment which can be easily used for patient's education.

PERIMETRY

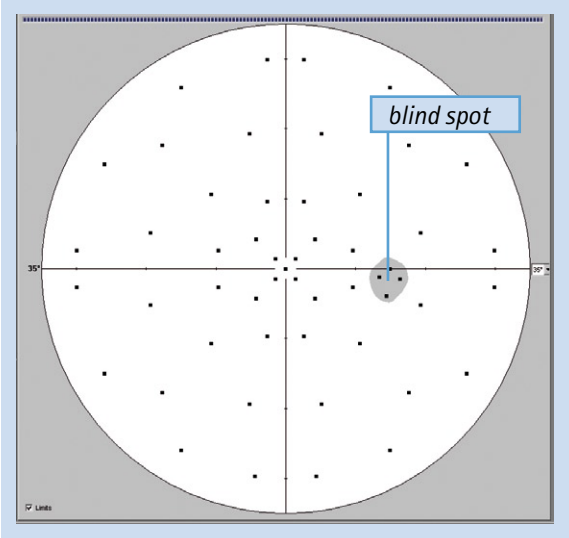
Visual field and Glaucoma

Even with an increasing number of various advanced imaging methods, perimetry remains the only method at hand for direct and comprehensive measurement of the visual function. Visual field tests continue to represent an important tool in early detection, staging and progression control of glaucoma. In the hand of an experienced practitioner, a perimeter is more than just a device for final confirmation of suspicions raised by previous diagnistic procedures; it can provide by itself precise and reliable information necessary for a diagnosis.

The first step: Scanning the visual field

Typically, a patient comes in contact with perimetry by undergoing a screening-type examination. Most often this is a consequence of high value IOP measurements, but it can be recommended also after routine examination of the anterior segment with the Pentacam (like in case of contact lens adjustment), or can follow other ophthalmologic investigations (like OCT). Belonging to the glaucoma risk groups (advanced age, family history, etc) can also represent a valid reason.

Most common screening-type examinations are supra-threshold tests. Although often considered having a lesser sensitivity, supra-threshold tests offer the considerable advantage of reduced duration (can be as short as 1-2 minutes) and lowered patient stress. A wise choice of the examination pattern can further improve the final results of the tests. Therefore, patterns adapted to the physiology of the eye might be more useful than old-style rectangular patterns.

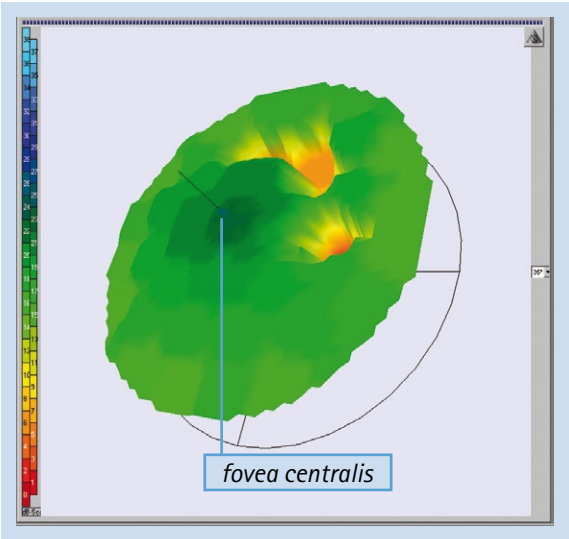


→ *Area 4 of Oculus Twinfield 2 (53 test points between 0°- 30°) The specific test patterns of all Oculus perimeters can always find and display the blind spot, using it as a reference scotoma.*

When numbers matter: Measuring the visual field

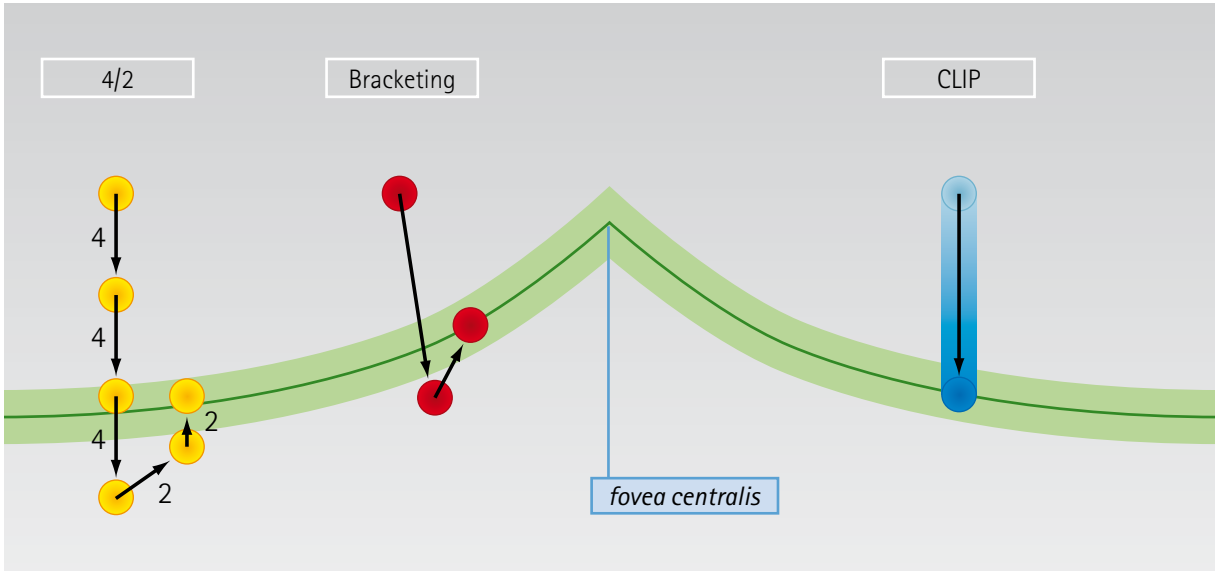
In order to get a comprehensive picture of the visual field, there is no way around measuring luminance increment sensitivity. Performed accurately, threshold tests not only offer information about the existence of defects in the visual field, but also provide a quantitative description of their shape, pattern and severity.

A drawback of precise threshold tests is their relatively long duration. The reliability of the tests is influenced by patient fatigue, from which in particular elderly patients suffer. Reducing the number of test points is not the best option (although for stable patients by all means adoptable). Consequently efforts are directed towards developing test strategies partially based on statistical models and interpolation.



→ *Color 3D representation of a threshold measurement on Oculus Twinfield 2, with noticeably glaucomatous visual field defects. (Area 4, CLIP)*

Threshold Strategies: From staircase to elevator



4/2 Strategy

The classical approach to threshold measurement is the so-called 4/2 strategy. Its name points to the fact that the measurement starts by presenting light stimuli in 4 dB steps in the direction towards the threshold (with increasing luminance for sub-threshold, and with decreasing luminance for supra-threshold stimuli), followed by 2 dB steps in the opposite direction after crossing the threshold. This way the measurement can be concluded after the second crossing of the threshold. But, this method can lead to an increased number of sub-threshold stimuli in the presence ot defects. This might cause frustration of the patients.

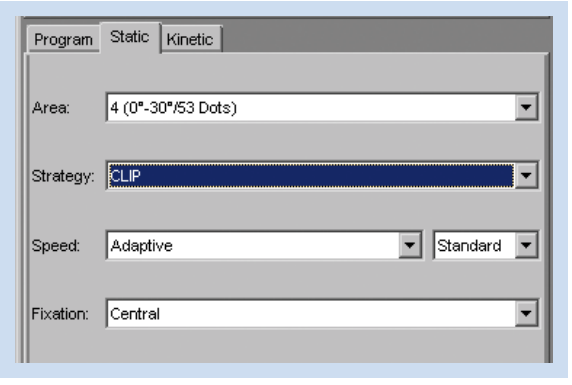
Interpolating Braketing Strategies

Using various statistical models and interpolation methods, the bracketing procedure may be abbreviated using larger steps and requiring a smaller number of stimuli. The inherent loss in precision due to the larger dB steps should be at least partially compensated by modeling and interpolation.

CLIP Strategy

CLIP (Continuous Light Increment Perimetry) follows a radically different path. In contrast to the regular bracketing methods, CLIP makes use of test points with luminance increased at a steady rate. As a result, test duration is drastically shortened. Also, reproducibility of the results is increased. In addition, convenient side effect, satisfaction level is kept high. This unique real threshold test that outperforms most interpolation based algorithms is now available in all Oculus perimeters.

In the case of CLIP, the test stimulus is always "on", its luminance being increased in time in smaller steps (usually 1 dB), until the patient gives a positive answer. By measuring the average reaction time of the patient and choosing the appropriate incremental rate of the luminance, a significant reduction of the examination time can be achieved, without losing precision or reproducibility. The fact that a stimulus with increasing luminance in the end is always observed generates elevated patient comfort.



→ *Choosing CLIP on Oculus perimeters*

THE OCULUS SOLUTIONS

The Easyfield

- Full-fledged, compact automated perimeter for static visual field examinations up to 30° – more than just a screener!
- Versatile hand control unit with built-in printer offers complete independence from usual computer systems, facilitating screening examinations even in locations not solely dedicated to this purpose
- Reliable and comparable results through standard perimetry – no need for additional perimeter to verify screening results
- GSS 2 (Glaucoma Staging System) following Brusini
- CLIP (Continuous Light Increment Perimetry) strategy offers the unique real threshold test that outperforms most interpolation based algorithms

The Centerfield 2

- The most compact projection perimeter for static and kinetic perimetry up to 70° eccentricity
- Total flexibility in choosing predefined test patterns and in creating individual ones
- Blue on yellow perimetry (SWAP - Short Wavelength Automated Perimetry) for early glaucoma recognition
- New ways of displaying results using color map and color 3D animation
- Increased reliability through easy re-check of test points

The Twinfield 2

- Projection perimeter according to Goldmann-Standard, for static and kinetic perimetry of the whole visual field
- Unique rear-surface projection system ensures precise reproducibility of test point locations and offers complete freedom in creating suitable examination patterns
- Manual perimetry available for various certification procedures
- Efficient follow-up comparing with previous examinations and intuitive graphical overlapping
- Color perimetry: SWAP and red on white perimetry

PERIMETER FEATURES

All features at a glance

	Easyfield	Centerfield 2	Twinfield 2
Optical System			
Stimulus generation	LED grid	Back-surface projection	
Eccentricity	30°	36° / 70°	90°
Background illumination	10 cd/m² (31.4 asb)		
Stimulus size (Goldmann)	III	III	I / III / V
Stimulus duration (ms)	200	200 / 500 / 800 / user defined	
Stimulus interval (s)	0.6 / 0.9 / 1.2 / adaptive	0.6 / 0.9 / 1.2 / user defined / adaptive	
Stimulus luminance range	0.1 – 3180 cd/m²	0.1 – 318 cd/m²	0.1 – 318 cd/m²
Stimulus luminance increment	0.1 log steps	0.1 log steps	0.1 log steps
Methods			
Static perimetry	●	●	●
SWAP (Blue on Yellow perimetry)	–	●	●
Red on White perimetry	–	–	●
Automated kinetic perimetry	–	●	●
Manual kinetic perimetry	–	–	●
Examination strategies			
CLIP (Continuous Light Increment Perimetry)	●	●	●
Classic Threshold (4/2)	●	●	●
Fast Threshold	●	●	●
Threshold oriented class strategy	●	●	●
Suprathreshold strategies (2-zone, 3-zone)	●	●	●
Freely selectable meridians, sectors and speeds (kinetic)	–	●	●
Semi-automated scotoma boundary mapping	–	–	●
Static and kinetic combinations	–	●	●
Areas			
30-2, 24-2, 10-2 (orthogonal patterns)	●	●	●
Central physiological patterns (Area 1-4, Area 7-8)	–	●	●
Peripheral physiological patterns (Area 5-6)	–	–	●
Estermann grid	–	●	●
Sectors	●	●	●
Profile	–	●	●
Custom test patterns	●	●	●
Re-check points	–	●	●
Quality			
Eye monitoring	●	●	●
Central threshold fixation control	●	●	●
Heijl-Krakau fixation control	●	●	●
Pupil diameter measurement	●	●	●
Motorized chinrest	–	●	●
Adjustable headrest	●	●	●
Ergonomic armrest	–	–	●
Remote monitoring	–	●	●
Result display			
Sensitivity values (dB)	●	●	●
Greyscale map	●	●	●
Probability map	●	●	●
3D animation	●	●	●
Profile	●	●	●
Symbols	●	●	●
GSS2 (Glaucoma Staging System)	●	–	–
Glaucoma Asymmetry Test (GAT)	●	●	●
Isopter representation	–	●	●

Technical data – Perimeters

	Easyfield	Centerfield 2	Twinfield 2
Operating voltage	100 – 240 V AC		
Perimeter bowl radius	30 cm		
Weight	4.6 kg	13.0 kg	42.0 kg
Interface	RS 232	USB	USB
PC compatibility	All Windows systems (Win98 or higher)		

Technical data – Pentacam

Feature	Pentacam®
Camera	Custom designed digital CCD camera with synchronous pixel sampling
Light source	Custom designed blue LED's *(475 nm, UV free)*
Processor	Ultra fast DSP with 400 million operations per second
Speed	50 scans in two seconds with approx. 500 true elevation points per scan and surface
Measurement range	
→ Curvature	3 to 38 mm 9 to 99 dpt
→ Accuracy	± 0.2 dpt
→ Reproducibility	± 0.2 dpt
→ Working distance	80 mm
Dimensions max. *(HxDxW)*	21.1 x 14.2 x 11 inches *(535 x 280 x 360 mm)*
Weight	19.5 pounds *(9 kg)*
PC minimum requirements	Pentium III 1.5 GHz, Windows XP, 512 MB RAM, special graphic card, USB interface, for further details please contact your authorized distributor

CE 0123 According to Medical Device Directive 93/42/EEC, annex IIa

WWW.OCULUS.DE

Oculus is certified by TÜV according to
DIN EN ISO 13485:2003/DIN EN ISO 9001:2000

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