

# OCULUS Keratograph® 5M

Dry Eye Evaluation  
and Topography





# OCULUS Keratograph® 5M

## Dry Eye Evaluation and Topography

The multi-purpose topographer has become an integral part of the ophthalmological and optometric practice. Examiner-independent measurements provide reliable data, clear analysis, and full documentation. Clear and easy-to-understand representations facilitate communication with your patients and ensure a time-saving workflow.

*"Thanks to its precision, repeatability, and versatility, the Keratograph 5M has the highest ROI of any device that I have owned in my 36 years of practice! With unrivaled early dry eye detection and diagnostic capabilities, it is also the ideal patient education platform. Using the images of the patient's own eyes to "show and tell" them exactly why their eyes are so dry. This is precisely what gains the buy-in to your prescribed treatment regimen and has made the Keratograph 5M the cornerstone of our dry eye program."*



Thomas Weshefsky, O.D., FIAOMC

*"The Keratograph 5M is an essential technology in any practice looking to incorporate dry eye disease management. The valuable information from meibography to non-invasive break-up time and tear meniscus height, just to name a few, and the intuitive way it is displayed helps in easy diagnoses, planning the most effective treatment, and helps to educate patients to ensure compliance."*



Paul M. Karpecki, O.D., FAAO

*"Turn dry eye guesswork into a simple scientific equation for predictable outcomes. The new OCULUS Crystal TEAR Report brings the dry eye protocol to life. Get the outcome patients want in a time frame that fits into your flow!"*



Crystal Brimer, O.D., FAAO

*"The Keratograph 5M is the most versatile piece of equipment that I have ever used in my practice. I especially love to show patients their meibography images. They are often surprised, even stunned, when they see their gland dropout, and are much more likely to follow my recommendations. A picture is truly worth a thousand words!"*



Marguerite McDonald, M.D.

*"The Keratograph has been a fantastic tool in our practice. It is incredibly versatile and we use it routinely for our Keratoconus patients, Dry Eye Clinic, and for Ortho-K in Myopia Control. What a great multipurpose tool with a small footprint!"*



Wes McCann, O.D.

# OCULUS Keratograph® 5M – Versatile

## Measurements With Placido Ring Illumination

White ring illumination is used to measure thousands of points on the entire corneal surface. Infrared ring illumination is also available for analyzing the tear film in order to prevent reflex tear secretion caused by glare.

## LED Measurements

The Keratograph® 5M proudly offers the perfect illumination for each function: White diodes for tear film dynamics, blue diodes for fluorescein images and infrared diodes for meibography.



*white illumination*



*infrared illumination*



*blue diodes*

## Where to find ?

- Crystal TEAR Report
- Meibography
- Classification of redness
- Tear film analysis

- Precise measurement of the corneal shape
- Extensive analysis and graphics
- Automatic keratoconus detection

- Course of disease displays
- Image and video documentation
- Measuring instruments

- Selection of contact lenses
- Fluorescein image simulation

- Technical data
- Network connection ability
- Software overview

Dry Eye Evaluation

Topography

Documentation

Contact Lens Fitting

Technology & Software

# Crystal TEAR Report

## Make Dry Eye Diagnosis Crystal Clear

Find out the cause of dry eye disease quickly and reliably with the assistance of the Crystal TEAR Report in the Keratograph® 5M. Carry out a comprehensive analysis using the measurement results as a basis for your diagnosis. All results are summarized in a patient-friendly, neatly arranged printout, enabling you to combine documentation and patient education.

The Crystal TEAR Report printout is divided into several sections:

- Header:** EYECARE OPTOMETRY logo, John Doe Optometrist, 123 Anywhere Street, Anytown | State 12345.
- Patient Information:** Date: 20.09.2017 | 17:06, Name: Doe John, ID: [redacted], Date of Birth: 20.02.2016.
- Diagnostic Results:**
  - (Oil) Meibomian Gland Deficiency:** Goal: Reduce tear film evaporation by creating better secretions and restoring gland function. Recommendation: TBUT, LOM, MG Func, NIKBUT.
  - Inflammation:** Goal: Reduce inflammation and secondary tissue damage; Clean up tear film contaminants. Recommendation: Conj. Staining, Conj. Injection, TF-Debris.
- GLOSSAR:** Definitions for Lid Appearance, TBUT, NIKBUT, Line of Marx, Meibography, Interferometry, Omolality, Corneal Staining, Conj. Staining, and Conj. Injection.

Your personal logo on the Crystal TEAR Report

Easy to understand color-coded pie chart for assessment of dry eye disease

Explanations of abbreviations and technical terms that your patients can understand

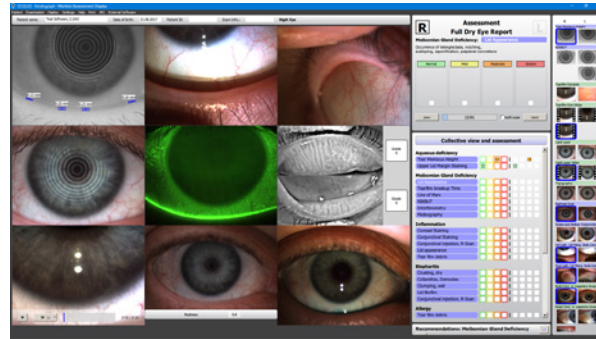
Comprehensible presentation of individual measurements and their results

Clear explanation of the treatment goal along with the necessary therapeutic steps

Write your personal recommendations here

## Bring Your Dry Eye Protocol to Life

Benefit from all the advantages of the new Crystal TEAR Report in the Keratograph® 5M: efficient diagnostics and screening, well-founded measurement results and greater patient loyalty. With its preselection of recommendations and the option to manually adapt them, the Crystal TEAR Report allows you to draw up an effective treatment, according to the individual causes of dry eye, in the shortest time. The result: a comprehensive dry eye analysis.



## Recording Made Easy

Up to 50 recordings can be carried out easily for documentation purposes. Readily understandable user tips and optimal auto-setting prior to each recording make it possible to delegate the entire measurement process. Despite the high degree of user guidance, you can directly delete faulty recordings as well as change settings and adapt the measurement sequence individually.

## Excel With Your Dry Eye Diagnosis

The entire course of diagnosis is documented, providing you with an ideal basis for your treatment decisions. All necessary recordings that are required to grade the individual's dry eye state, can be viewed at the same time. Depending on the grade you obtain, you can then determine a suitable treatment plan.

Additionally, you can enter the data from other tests, such as Osmolarity, Schirmer's Test, Phenol Red Thread Test, and more.

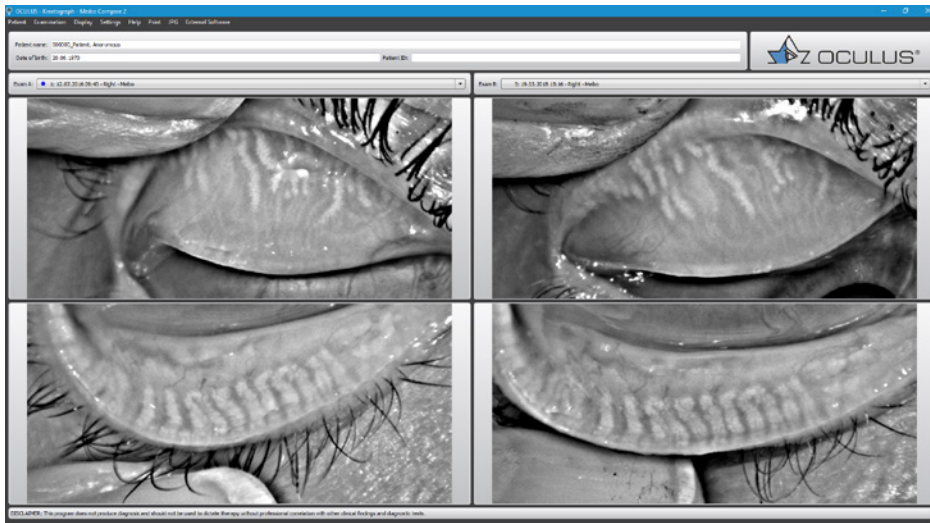
## Documentation and Patient Education

The Crystal TEAR Report surely and safely walks you through all the necessary assessment criteria that make up a comprehensive dry eye analysis. To complete the treatment plan, you can manually enter your dosage recommendations for the individual therapeutic measures on the printout. Making it an easy-to-grasp, optimal means of patient education.

# Meibo-Scan

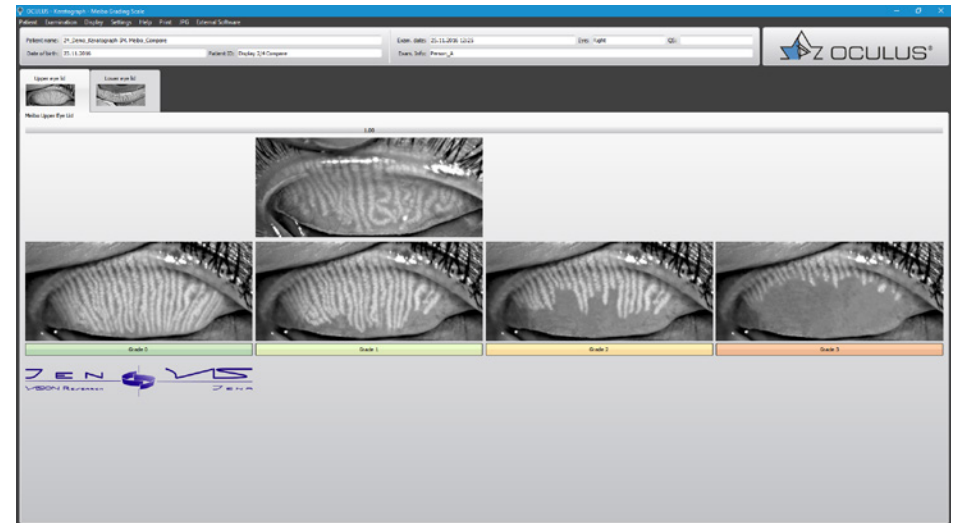
## Meibography of the upper and lower eyelid

The new multi-functional Keratograph® 5M easily and efficiently integrates difficult examinations such as meibography. The dysfunction of meibomian glands is the most frequent cause of dry eye. Morphological changes in the gland tissue are made visible using the Meibo-Scan.



## Intuitive Comparison of Meibography Findings

The “Compare Meibo Exams” function makes it possible to assess the condition of the glandular tissue over time and hence the success of treatment. It is also helpful in communicating with and educating patients.



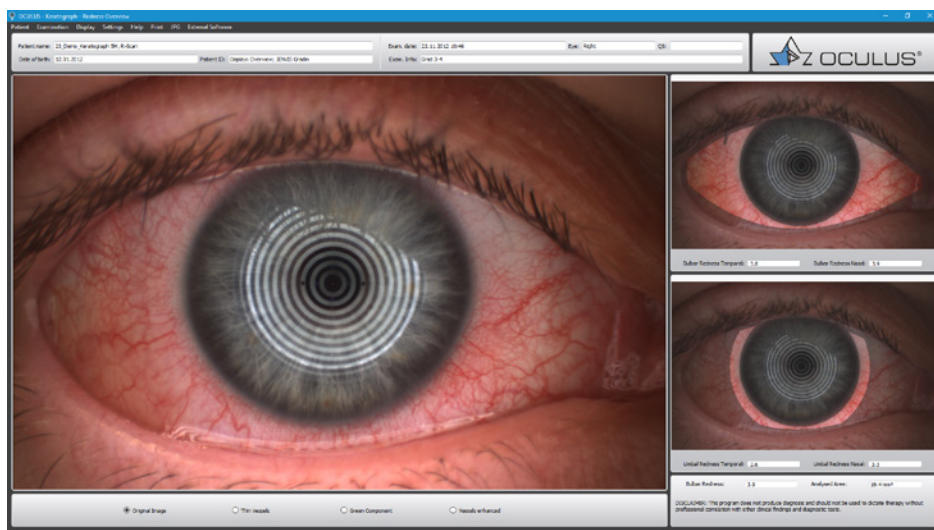
## JENVIS Grading Scales

These four-point grading scales allow easy classification of MGD based on an individual meibography. Reference-state images assist in classifying the gland structure as normal or indicative of mild or severe MGD.

# R-Scan

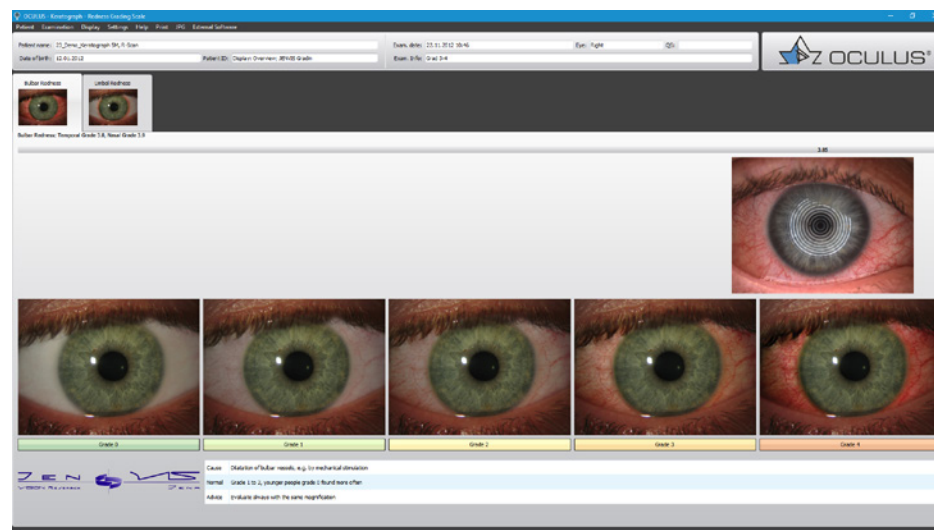
## Automatic classification of conjunctival redness

Previously, conjunctival redness evaluation has been carried out subjectively and the results have varied according to the examiner's qualification. The Keratograph® 5M can classify the bulbar and limbal redness using the R-Scan. The R-Scan detects vessels in the conjunctiva and evaluates the degree of redness. This eliminates the need for time-consuming comparisons and provides greater reliability during evaluation.



## Bulbar and Limbal Redness

Different display options help to classify the degree of redness. Choose between the camera image, view of fine vessels in the conjunctiva, red-free or contrast-enhanced display options. Bulbar and limbal redness are evaluated in the temporal and nasal areas, and all results are saved automatically.



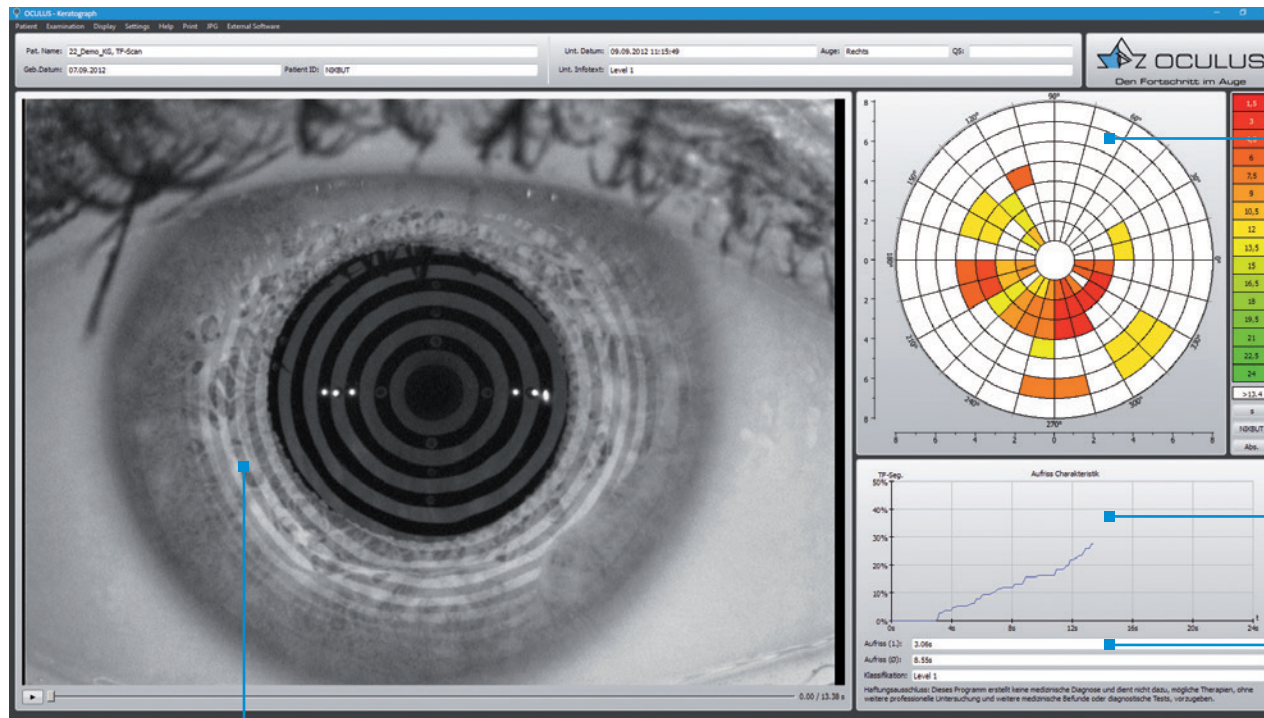
## JENVIS Grading Scales

The degree of redness is based on the JENVIS Grading Scales. The comparison of your examination results with the actual-scale images of the JENVIS grading scale, facilitates the conversation when consulting with your patient. Further information on possible causes of redness, the normal condition as well as practical notes for capturing an image are provided below the actual-scale images.

# TF-Scan

## Evaluation of non-invasive tear film break-up time

The non-invasive tear film break-up time (NIKBUT) measures tear film stability. The NIKBUT is automatically measured within seconds, without fluorescein application. Human eyes are not able to perceive infrared illumination. Glare and reflex tear secretion are therefore avoided during the examination. The TF-Scan visualizes the results in an easy and understandable way – for you and your patients.



The Tear Map shows the affected areas: The respective break-up time is graphically illustrated for each segment in seconds and according to the principle of a traffic light.

The graph shows percent of the examined area that is affected during the measuring period.

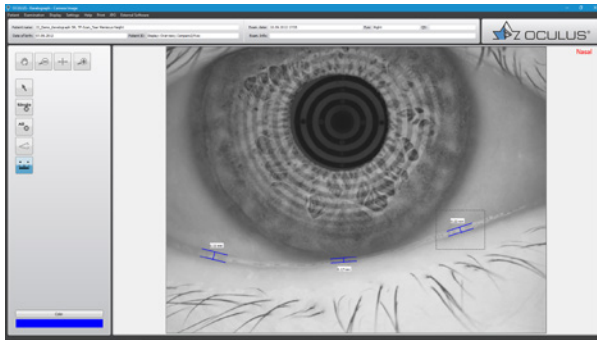
Data field showing tear film break-up time (NIKBUT) in seconds and the corresponding classification.

You can watch the video after the measurement. The break-up areas detected by the software are highlighted accordingly.



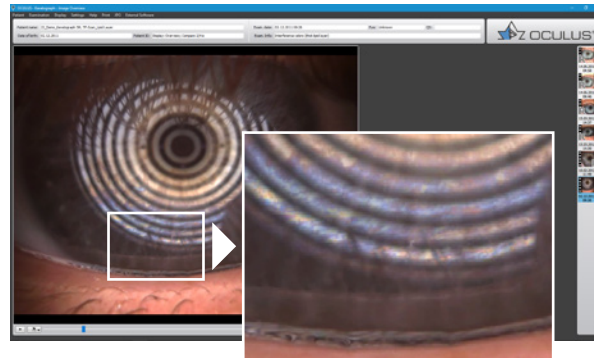
## Quantity and Quality of the Tear Film

The high-resolution color camera makes the smallest structures visible. This enables you to measure the tear meniscus height and evaluate the lipid layer, as well as analyze the tear film dynamics. Not only do you gain very important findings about tear film break-up time, but also those about the quantity and quality of the tear film.



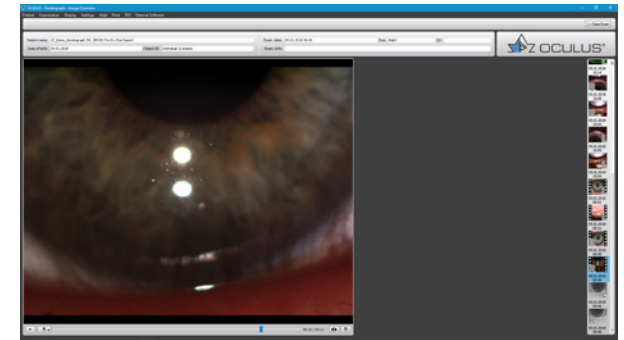
### Tear Meniscus Height

Never has a precise measurement been so easy. You can evaluate the course of the tear meniscus along the eyelid by means of the new infrared illumination and precisely measure the tear meniscus height with the built-in ruler. Different magnification levels facilitate measurement and the resulting value is automatically saved in the patient file.



### Evaluation of Lipid Layer

Hyper-evaporative dry eye is easily overlooked when using conventional tests. Thus, evaluating the lipid layer of the tear film is even more important. With the Keratograph® 5M you can record videos of interference patterns of the lipid layer. Distribution characteristics, morphology and thickness of the lipid film can be continuously evaluated.



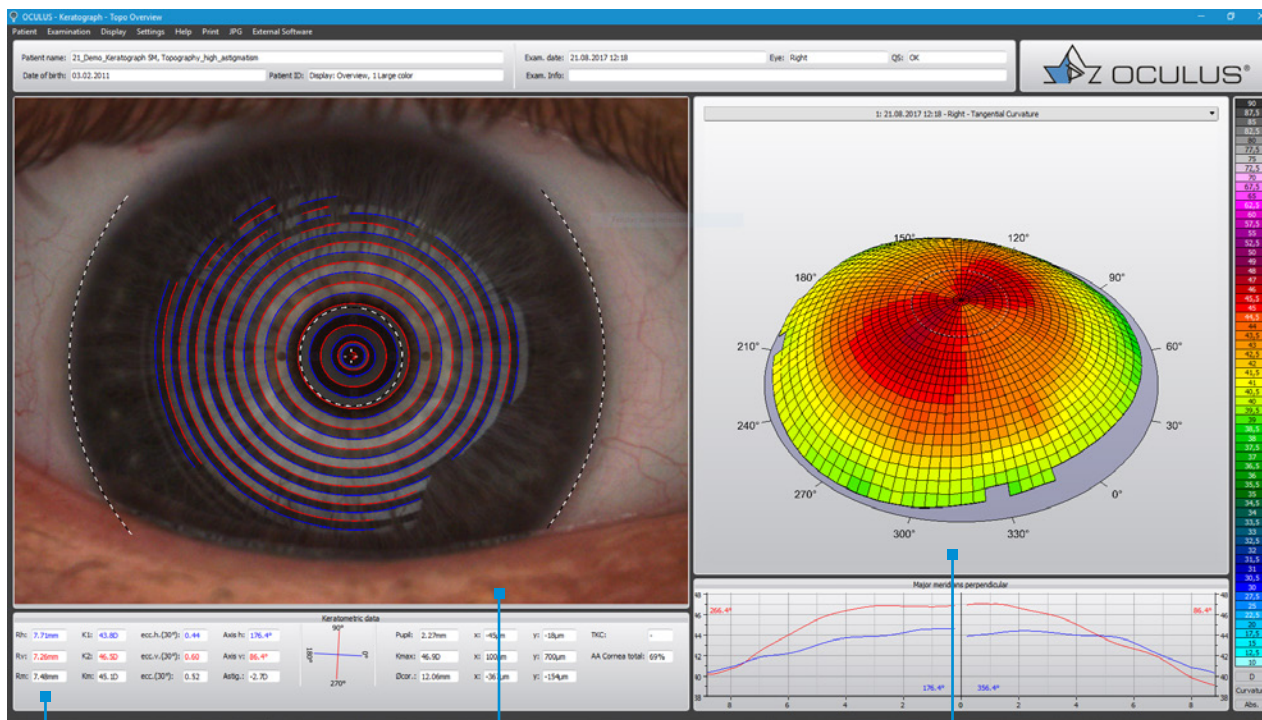
### Tear Film Dynamics

The tear film contains numerous particles. These can be made visible using a specific light source. These particles are distributed in the tear fluid from bottom to top during each blink. The velocity of these particles provides information on tear film viscosity. You can quickly and easily evaluate the quantity and movement of these tear film particles using the TF-Scan.

# Topography

Quick, precise, and clear

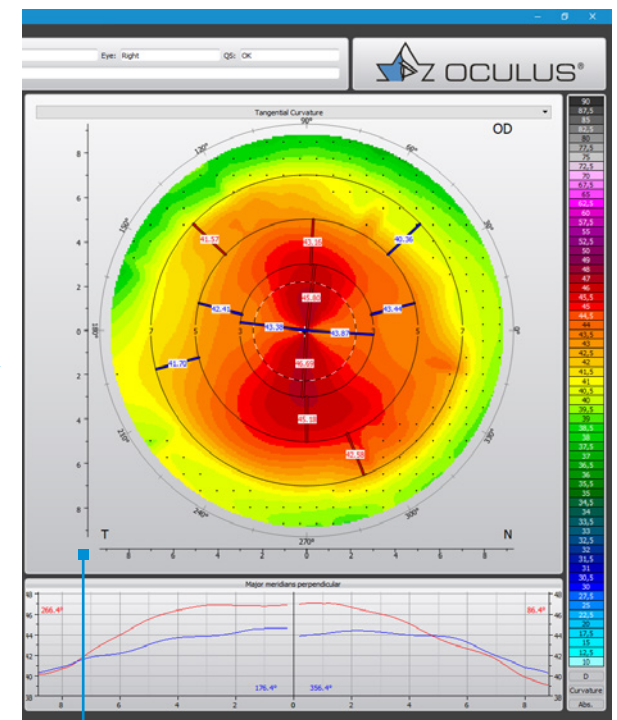
Aside from topography and automatic keratoconus detection, the Keratograph® 5M provides a large contact lens data base and many analyses for daily practice. The built-in keratometer and automatic measurement ensure the utmost accuracy and reproducibility. After completing the measurement, the overview display provides a detailed outline.



Keratometric data, diameter of the cornea and pupil, K-values and index for keratoconus detection, size of the analyzed surface

Built-in measuring instrument for measurements in the camera image

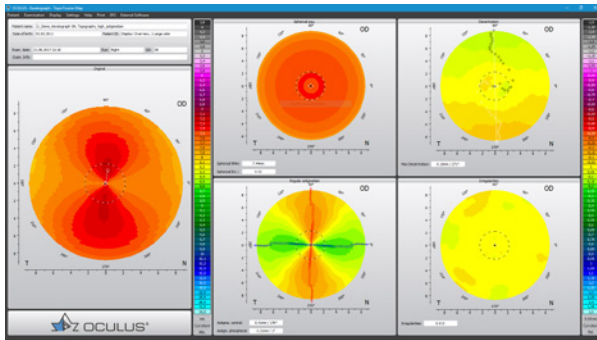
3D view can be selected and displayed directly beside the camera image



Display as sagittal or tangential curvature, elevation data or refractive power, overlay of apex position, pupil center and contour, numerical values and major meridians

## Detailed Display of the Cornea

The Keratograph® software includes a reliable screening package for corneal disease detection, lens fitting and refractive surgery. The complex corneal surface structure is measured by means of mathematical analysis, which serves as the basis for accurate detection of irregularities like keratoconus. In addition, optical properties of the front surface of the cornea are exactly characterized.

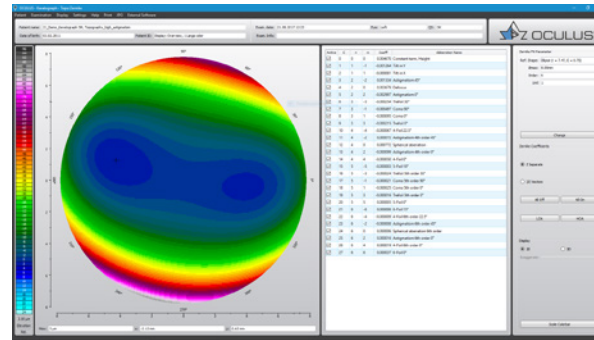


## Fourier Analysis

The refractive power of the front surface of the cornea consists of different components. The Fourier Analysis identifies four of them which are shown in the following displays:

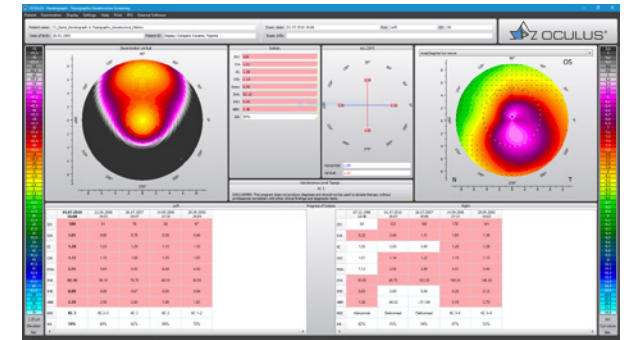
- Spherical component
- Decentration
- Regular astigmatism
- Irregularities

Pathological changes can be quantified and possible effects on visual acuity can be explained.



## Zernike Analysis

Zernike polynomials are adapted to the elevation data of the cornea, which is crucial for locating the apex. The apex position is labelled with a cross. This display shows you if a rear surface toric lens is applicable to the particular case. Zernike polynomials and the aberration coefficient give you important indications of the imaging quality of the corneal surface. Abnormal values are marked in color.



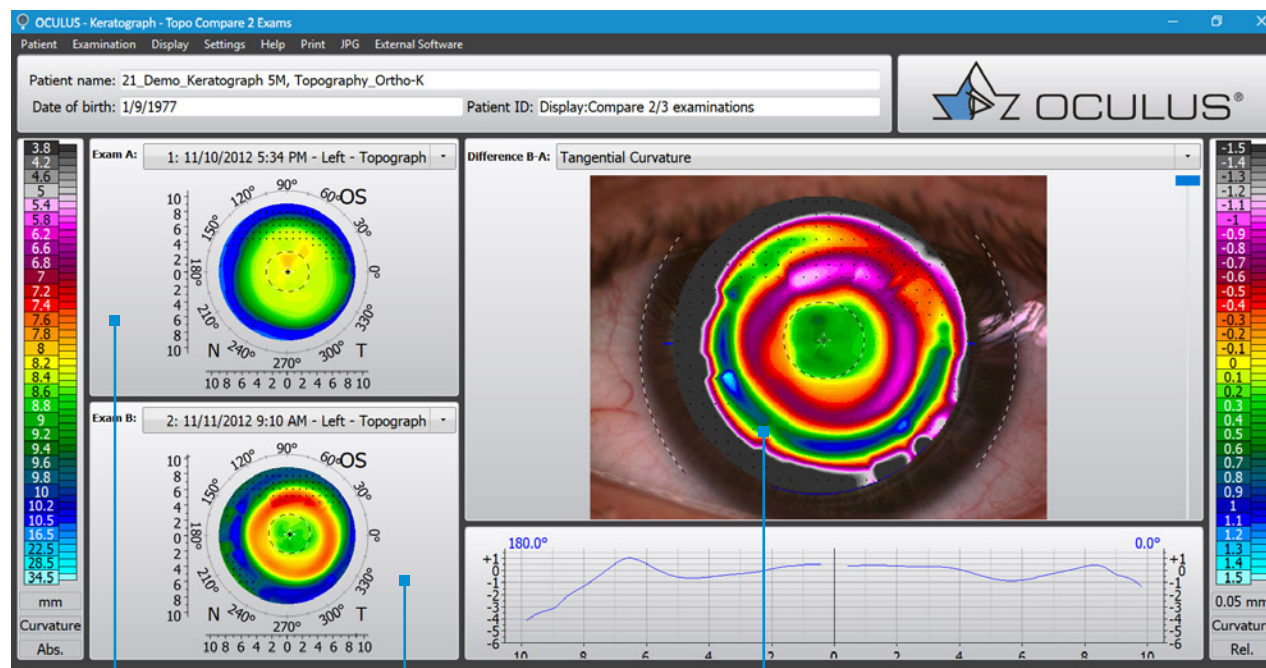
## Topographic Keratoconus Screening

Keratoconus classification is based on numerous parameters. The Topographic Keratoconus Screening display merges these parameters. The colored label illustrates abnormal values. Temporal changes of the parameters are shown side by side in a table, to facilitate your follow-ups. The Amsler classification system is applied to the keratoconus domains.

# Complete Documentation

## Follow-ups provide reliability

Follow-ups require comparison of several examinations. In doing so, changes can be easily detected and fully documented. Regular follow-up examinations provide reliability and increase the trusting relationship between you and your patient. The Keratograph® software contains both data and image documentation.



OrthoK baseline

OrthoK after one night lens wear

Difference map with color iris image overlay

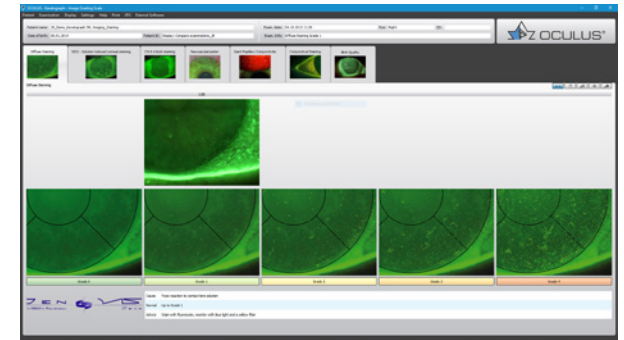
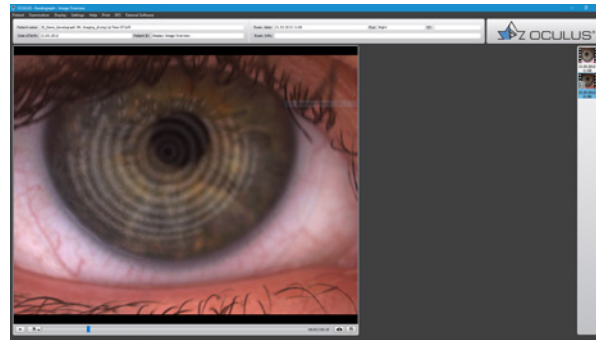
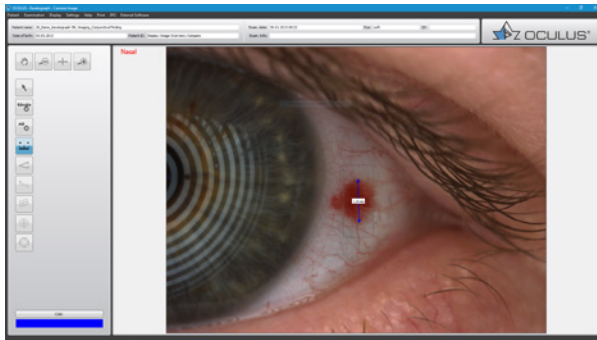
## Comparing Examinations

The Compare 2 Exams display shows changes over a certain period of time, e.g. the progressive course of disease of keratoconus. Choose between sagittal or tangential curvature and between elevation data or refractive power.

Use the Compare 2 Exams display for a right/left or before/after comparison e.g. OrthoK fit evaluation. The easy-to-understand displays help you describe even complex contexts to your patient.

## A Picture Is Worth a Thousand Words.

The Keratograph® 5M contains features that offer optimal conditions for your image documentation such as the high-resolution color camera and different illumination options. An image aids in communication with education of your patients, thus eliminating the need for long explanations. You save time with only one mouse click. The Keratograph® 5M comes equipped with a wireless joystick including a release function. Capture images and video sequences with a single push of a button!



### Precise Measurements Instead of Rough Guesses

The Keratograph® 5M is the ideal device for your professional documentation. The imaging software includes features such as

- magnification function
- hand tool
- measuring tool
- angle measurement

Pathological changes can be exactly localized, and changes in size can be determined. This ensures that all of your patient's questions will be answered.

### High-Resolution Images

You can evaluate the wettability of contact lenses, without fluorescein application and determine the exact rotating of toric lenses. It is also possible to detect lipids and deposits on the lens surface, as well as corneal staining or vascularization. Show your patients images they have never seen before.

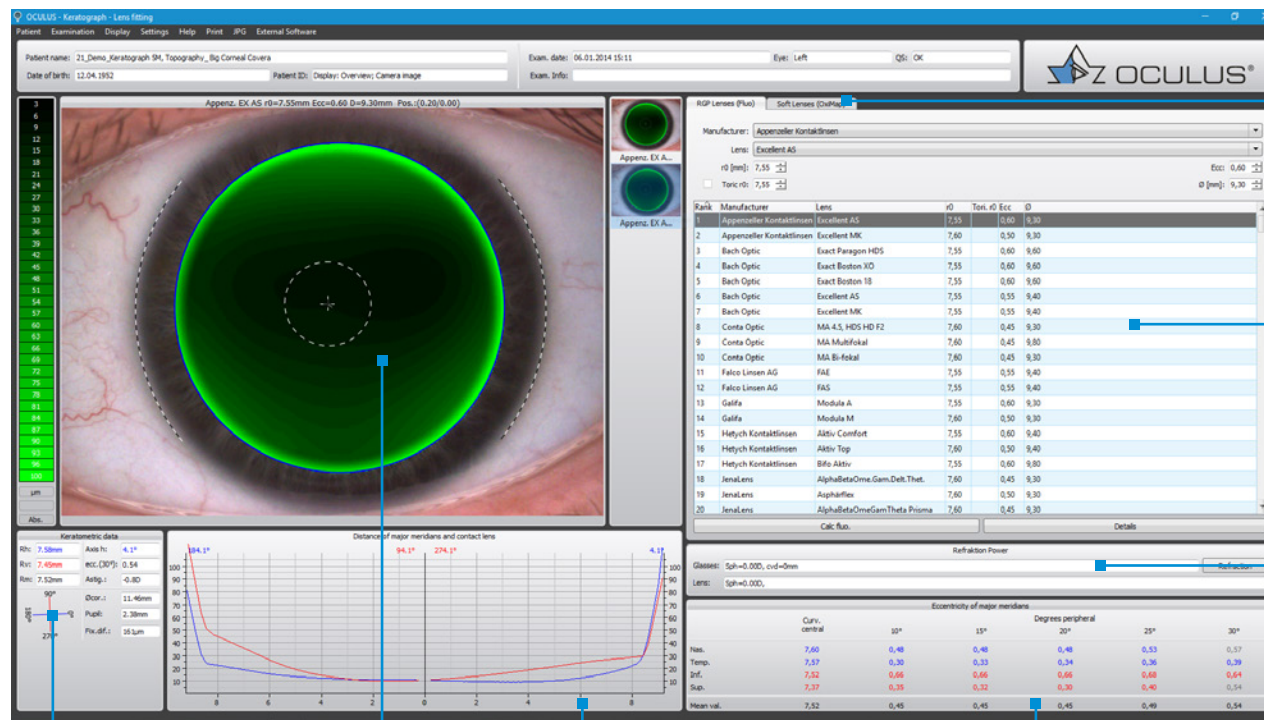
### Reliable Diagnosis Documentation

The resulting classification from corneal staining requires well-trained examiners. It is difficult to estimate the number of hyper-fluorescent dots on the corneal surface, but the integrated JENVIS Grading Scales facilitates this evaluation. Every image taken can be compared with a sample image on the screen. Vessel injections can also be evaluated and documented in this way.

# Contact Lens Fitting

Professionalism through innovation

An ideal lens is chosen from the large lens data base and is then suggested in the Lens Fitting display. Based on this topographic data, a simulated fluorescein image of this particular lens is created. You can then take real fluorescein images with the Keratograph® 5M and compare them with the simulated images.



Selection between RGP and soft lenses

Contact lens suggestion from the large data base

Subjective refraction data and CVD conversion

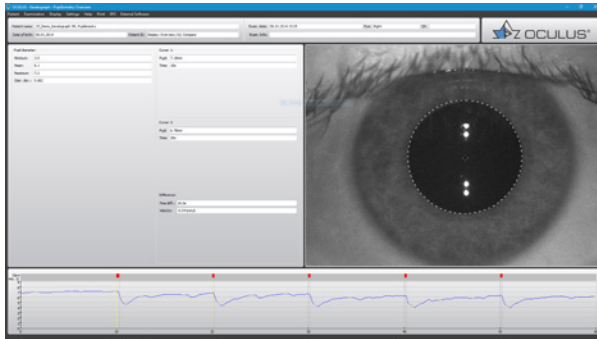
Keratometric data, diameter of the cornea and pupil, fixation deviation

Distance of major meridians of the cornea from the lens  
Simulated fluorescein image of a toric RGP lens

Eccentricity values for both major meridians

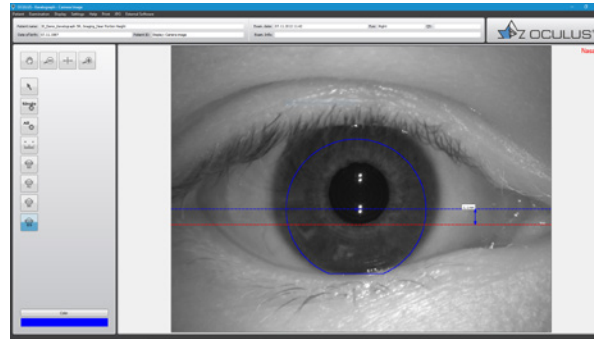
## Multifocal, Bifocal, Toric

With the Keratograph® 5M you can quickly and precisely measure all of the data needed for multifocal, bifocal, and toric contact lenses. These measurements also facilitate the fitting of multifocal or bifocal lenses. Furthermore, the Keratograph® 5M software can be linked to fitting programs of various contact lens manufacturers.



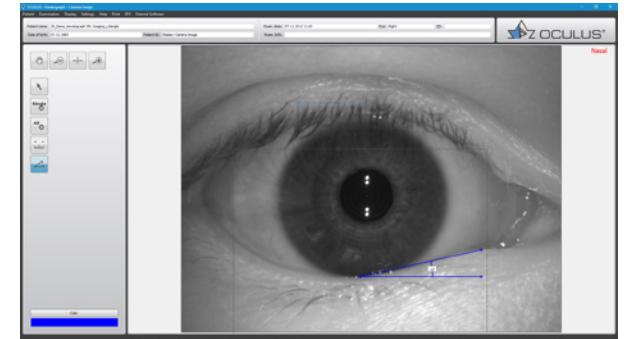
### Pupillometry

Using the "Pupillometry" option is a quick and easy way to measure the pupil size of your patients under different illumination conditions. This option not only supports you when fitting multifocal lenses, but also when measuring the optical zone before refractive or cataract surgery.



### Near-Portion Height Measurement

The near-portion height of RGP bifocal lenses can be simulated and precisely determined with this software, even before ordering the first-fitting lens. This also facilitates the complex fitting of multifocal lenses.



### Palpebral Angle Measurement

The imaginable angle of the nasal side of the lower eyelid can be measured to determine the expected nasal rotation when fitting lenses for astigmatism.

# Floating License Key

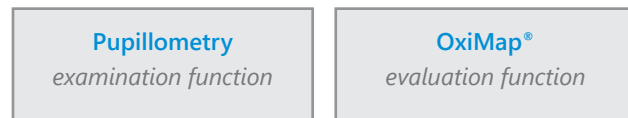
More flexibility with the OCULUS license model

## Activate Functions Exactly as You Need Them

The choice is yours in how you use the Keratograph® 5M and which examination and evaluation functions you desire. You can order additional functions of optional evaluation functions, according to your modular design principle. After purchase, licenses for the respective evaluation functions are activated on the OCULUS Floating License Key and are provided in your network. It is possible to call and view previously performed examinations for free on all workstations within the network.

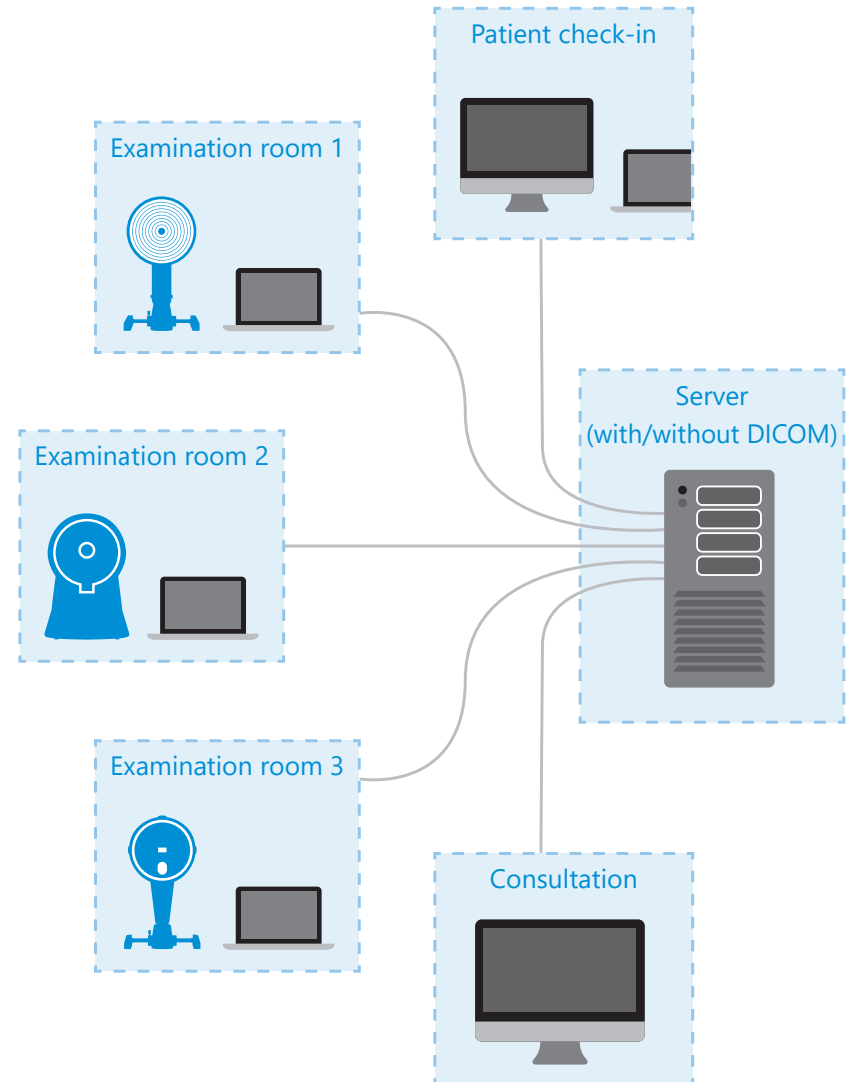
### Optional functions:

You can decide which additional functions to allocate to each device.



## Efficiency Through Networking

The OCULUS patient data management system enables you to merge all OCULUS devices in a local network. It allows you to collaborate with external data management systems (EMR) to optimize your workflows. DICOM interface is not necessary for device connection.





# All Features at a Glance

Customize the OCULUS Keratograph® 5M to your own requirements!

## Software included

Topography
CL Back Surface
Overview
1 Large Color Map
4 Maps Selectable
Camera Image
3D Cornea
Fourier Analysis
Zernike Analysis
Topographic Keratoconus Screening
Elevation Map
Corneal asphericity
Lens Fitting
Show 2 Exams
Compare 2 Exams
Compare 3 Exams

## Examination functions

	Standard features	Optional features
TF-Scan <i>Evaluation of lipid layer and tear film dynamics, measurement of tear meniscus height and non-invasive tear film break-up time (NIK BUT)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
R-Scan <i>Automatic classification of bulbar and limbal redness</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Meibo-Scan <i>Meibography of upper and lower eyelid</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pupillometry <i>Examination of pupillary response using the pupillometer, asymmetry test and manual measuring mode</i>	<input type="checkbox"/>	<input type="checkbox"/>
Imaging <i>Image and video documentation with fluorescein imaging, near-portion height measurement and eyelid angle measurement</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

## Evaluation functions

	Standard features	Optional features
Crystal TEAR Report (2 licenses included) <i>Comprehensive summary display of all available dry eye tests</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Keratoconus package (1 license included) <i>Includes Topographic Keratoconus Screening and Zernike Analysis</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lens Fitting (1 license included) <i>Simulation of fluorescein images of RGP lenses</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
OxiMap® <i>Graphic display of oxygen transmissibility (Dk/t value) of soft lenses</i>	<input type="checkbox"/>	<input type="checkbox"/>

Dry Eye Evaluation

Topography

Documentation

Contact Lens Fitting

Technology & Software

# OCULUS Keratograph® 5M

## Technical Data

General information	
Measuring range	3 - 38 mm
Accuracy	9 - 99 D
Reproducibility	± 0.1 D
Number of rings	± 0.1 D
Working distance	22
Number of evaluated data points	78 - 100 mm
Camera	22 000
illumination source	Placido illumination: white diodes Placido illumination: infrared diodes (880 nm) Imaging illumination: blue diodes (465 nm) Meibography: infrared diodes (840 nm) Tear film dynamics: white diodes Pupillometry illumination: infrared diodes (880 nm)
Technical specifications	
Dimensions (W x D x H)	275 x 320 - 400 x 480 - 510 mm (10.8 x 12.6 - 15.7 x 18.9 - 20.2 in)
Weight	Measuring head: 3.2 kg (7.1 lbs) With xy base: 6.1 kg (13.5 lbs)
Max. power consumption	18 W
Voltage	90 - 264 V AC
Frequency	47 - 63 Hz
Recommended computer specifications	CPU Intel® Core™ i5-7600, 1 TB HDD, 8 GB memory, Windows® 10Pro

**CE** 0123 in accordance with Medical Device Directive 93/42/EEC

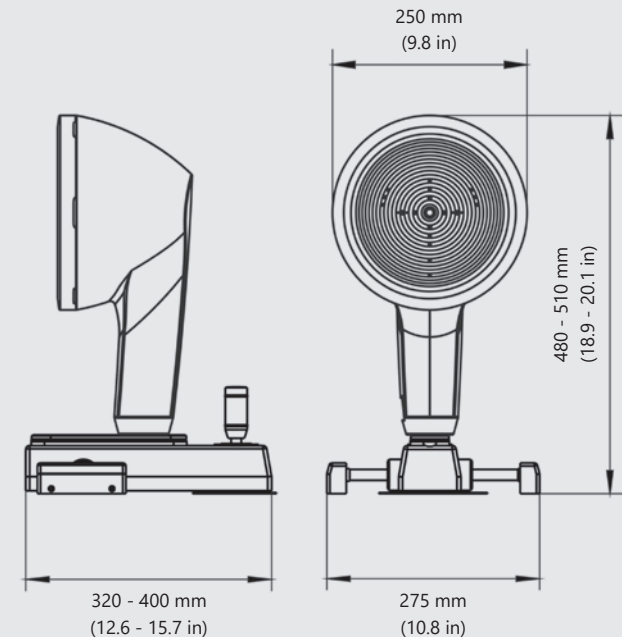
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The OCULUS QM system is certified in accordance with ISO 13485 (MDSAP) and (EU) 2017/745 (MDR).



US version. The availability of products and features may vary by country. OCULUS reserves the right to change product specifications and design. All information is valid at the time of printing (02/23).

OC/1895/WZ/US