



The world's leading manufacturer of wavefront sensing technology introduces ClearWave™ for testing contact lenses in both wet and dry states. ClearWave measures sphere, cylinder, axis, and aberrations such as coma and spherical aberration. Additionally, ClearWave provides detailed wavefront maps and Zernike coefficients for the new field of customized contact lenses and also measures multizone contact lenses (bifocals and most multifocal designs).

The primary optical sensor in ClearWave is a Shack-Hartmann wavefront sensor. Advantages of these sensors include small size, ruggedness, accuracy, and vibration insensitivity.

The sampling density in ClearWave is 0.1 millimeters, allowing small features to be revealed. Over larger areas, the quantity of samples (5200 samples in a 7mm analysis diameter) results in high repeatability and accuracy.

ClearWave has been designed to assist contact lens manufacturers in fast and accurate screening of standard and multifocal lenses. The wide open loading area leaves room for automation equipment to move contact lenses through the measurement path. In a laboratory environment, a variety of mounts and wet cells enable easy part handling.

ClearWave is also an enabling technology for the new field of wavefront customizable contact lenses. Optometrists can measure the patient's eye. When they order customized contact lenses to correct the patient's vision, the manufacturer can measure these with ClearWave for quality control.

Lumetrics® has been working closely with universities and other agencies in developing this exciting new capability, including research into how particular Zernike terms affect human vision and metrics that predict human visual performance.

Features

- **Simultaneous Measurement of:**
 - **Sphere, Cylinder, Axis**
 - **Wavefront Aberrations**
 - **Zernike Polynomials**

- **High Spatial Resolution**
- **Reliable, Simple Operation**
- **Wet and Dry Testing**
- **Production Line Capability**

ClearWave Product Specifications

Contact Lens Measurement Capabilities:

- Measures spheric and toric contact lenses
- Measures multizone type multifocal contact lenses
- Measures soft or rigid contact lenses
- Measures hydrated or non-hydrated contact lenses (extended range for dry is an option)
- Optical measurements are:
 - Sphere
 - Cylinder
 - Axis
 - Spherical Aberration
 - Coma
 - Seidel Aberrations
 - High Order Aberrations
 - Zernike Polynomials up to 11th order (OSA or Malacara Format)
 - Multizone Analysis (for bifocal contact lens)
- In addition to the measurements mentioned above, the following data files are available:
 - Modal Wavefront Map
 - Zonal Wavefront Map
 - OPD Map at all points within analysis diameter
 - Zemax compatible Zernike files

Standard Equipment:

- Measurement wavelength 540 nm (green)
- Rectangular cuvette to hold wet contact lenses, $\lambda/20$ RMS
- Stainless steel wet cell with fixed lower window and removable top window
- FireWire alignment camera for precise alignment of contact lens to wavefront sensor
- Megapixel Camera Link Wavefront Sensor digital camera
- External 100-260 VAC 50/60 Hz power supply
- Custom Controller with 17" monitor
- **High Dynamic Range ClearWave Wavefront Sensor:**
 - Megapixel Camera Link Wavefront Sensor digital camera
 - 68x68 lenslet array grid
 - Field of view: 10.4 x 10.4 mm
 - Spatial resolution: 0.152 mm
 - Spherical range: +8 to -16 D for dry lenses (Dry spherical range wet converts to On-Eye range of -74 to +37 D for lens index 1.43)
 - Cylinder range: 10 (+/-5) diopters for 6 mm analysis dia. dry.

(Dry cylinder range wet converts to an On-Eye range of 46D for lens index 1.43)

- Spherical aberration accuracy 0.004 μm (dry)
- Spherical aberration repeatability 0.002 μm (dry)

High Resolution ClearWave Wavefront Sensor (Standard):

- Megapixel Camera Link Wavefront Sensor digital camera
- 101x101 lenslet array grid
- Field of view: 10.4 x 10.4 mm
- Spatial resolution: 0.104 mm
- Spherical range: +8 to -16 D for dry lenses (Dry spherical range wet converts to On-Eye range of -74 to +37 D for lens index 1.43)
- Cylinder range: 6 (+/-3) Diopters for 6 mm analysis diameter for dry lenses (Dry cylinder range wet converts to On-Eye range of 27D for lens index 1.43)
- Spherical aberration accuracy 0.004 (dry)
- Spherical aberration repeatability 0.002 μm (dry)

Prism Measurement:

- Prism measurement 0 to 3 prism diopters for dry lenses
- Prism accuracy 0.1 prism diopters
- Prism repeatability 0.05 prism diopters

Mechanical:

- **ClearWave:**
 - Height, width, length: 13.5 x 9 x 20 inches
 - Weight: 45 lbs
- **Controller:**
 - Height, width, length: 13 x 5 x 12 inches
 - Weight: 14 lbs
- **External power:**
 - Height, width, length: 14 x 9 x 10 inches
 - Weight: 3 lbs
 - Line voltage: 100-260 VAC 50/60 Hz
 - Line current: 2.0 A

Options:

1. Dry measurement option
2. Multifocal analysis with annular software masks
3. Optional high resolution ClearWave™ or high dynamic range wavefront sensor
4. Bar code reader input of lens labels

Specifications are subject to change without notice.

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