

Contact Lens Refractive Index Measurement

Monitoring refractive index for ophthalmic lens quality control

Contact Lenses: Materials and Optical Properties

Contact lenses are precision medical devices used to correct vision directly on the eye. Their optical performance depends on both the lens geometry and the refractive index of the material.

Modern lenses are typically made from polymer materials and can be classified into:

- Hydrophilic (soft) lenses, which absorb water and change their refractive index depending on hydration
- Hydrophobic (rigid) lenses, which are more dimensionally stable but require precise surface handling during measurement

Even small variations in refractive index can affect the optical power (dioptré), making accurate material characterization essential throughout production.

Controlling Refractive Index

Contact lenses and intraocular lenses (IOLs) are highly sophisticated optical components used to correct vision. Their performance is directly determined by the refractive index of the lens material, which defines the optical power (dioptré) and overall visual quality.

Precise control of refractive index during material development, production, and quality control is therefore essential to ensure consistent lens performance and patient safety. Modern ophthalmic production requires high-precision refractive index measurement across different wavelengths and temperatures to fully characterize optical materials.

Why Monitoring is Essential

Without precise measurement, manufacturers risk:

- Incorrect optical power (dioptré deviations)
- Inconsistent product quality
- Increased batch rejection rates

Refractometry provides a direct and reliable measurement of optical material properties.

For ophthalmic applications, it enables:

- Determination of refractive index
- Characterization of polymer materials used for lenses
- Quality control of incoming raw materials and finished products

Dispersion and Multiwavelength Analysis

In addition to the refractive index at a single wavelength, the dispersion behavior of contact lens materials is of high importance. The refractive index varies with wavelength, influencing how light is transmitted and focused by the lens.

Multiwavelength refractometry enables the determination of the dispersion curve over a broad spectral range (e.g. 360–960 nm), closely representing the visible and near-visible region relevant for human vision.

This allows:

- Accurate simulation of real optical behavior in the eye
- Detailed characterization of polymer materials
- Optimization of lens design and performance

By combining precise refractive index measurement with dispersion analysis, manufacturers can ensure optimal visual performance, consistent product quality, and compliance with stringent medical standards.

Solution from SCHMIDT + HAENSCH

Using the SCHMIDT + HAENSCH Multi-Wavelength Refractometer ATR L provides a precise method for determining the refractive index and dispersion curve of contact lens materials. The instrument enables measurements across multiple wavelengths, allowing a comprehensive characterization of optical properties relevant for lens performance. Integrated temperature control ensures accurate measurements under defined conditions.

The ATR L is ideally suited for laboratory, supporting both material development and routine quality control of contact lenses and their polymer raw materials. For solid samples such as contact lenses, it is generally recommended to use a solid sample clamp. Additionally, the use of a suitable contact liquid (e.g. diiodomethane) is advised to improve optical coupling and measurement accuracy.



ATR L
Multi-Wavelength Refractometer

Product type	Product	ID-N°
Laboratory Refractometer	ATR L Multi-Wavelength Refractometer	03751

Accessories Sample compartment door for solid samples **17290 + 14697**

Advantages

- High-precision refractive index measurement
- Measurement across 7 wavelengths (dispersion analysis)
- Temperature-controlled measurements at application conditions
- Fast and reproducible results
- Reduced batch rejection and improved yield
- Reliable quality control of optical materials

Typical industries

- Contact lens manufacturing
- Intraocular lens (IOL) production
- Ophthalmic materials research
- Polymer and optical material development
- Medical device industry