What is a Lensometer?

Lensometer is an American Optical trademark (generic term - focimeter). It is an instrument used primarily by optometrists and opticians to determine the optical characteristics of lenses, such as power or focal length. It can be used both to identify and to verify eyeglass prescriptions. It can also be used to ensure lenses are correctly mounted in frames and to properly orient and mark uncut lenses prior to grinding into finished products. Since more than half of adults in the developed world wear prescription eyeglasses, a substantial segment of the world’s population wears a product whose accuracy and uniformity are at least partially due to the Lensometer.

Evolution & Development of the Wellsworth American Optical Lensometer Prior to 1921 Introduction to the Marketplace

The first Lensometer to be successfully marketed on a commercial scale and widely used in optical dispensaries was the Wellsworth Lensometer, produced by the American Optical Company (AO) and introduced in 1921. Wellsworth was a trade name widely used by AO between 1900 and 1929.
Devices to determine the power of a lens had emerged as early as 1876, but the first practical instrument permitting direct readout was developed by Charles Troppman in 1912. His device, however, was primarily a laboratory instrument. In 1913 Troppman’s company (F. A. Hardy Co.) merged into AO. Work had begun on a Lensometer at AO around 1910. The addition of Troppman and his patents put the company’s work on a fast track. AO’s first model was the 1914 unit pictured above.

Lensometer Development 1914 -1938

In 1916 AO hired Edmund Tillyer to head its research efforts, and in 1918 added Dr. Estelle Glancy to the team. AO’s research facility refined Troppman’s design, worked out the theoretical underpinnings of the instrument, and slowly transformed Troppman’s laboratory device into an easy-to-operate instrument that could be manufactured cheaply enough to be marketed to opticians everywhere. The 1916 and 1919 models – stepping stones on the way to a commercial device – are pictured to the left. AO was ready to market a device by 1916, but delayed release due to WWI.
Wellsworth Lensometer

SCIENCE ADVANCES

and with the advent comes the Wellsworth Lensometer.

A microscope, for instance, in Ophthalmic Science, it seems to enable the eye of the examiner to see the corneal surface of the eyes, the blood vessels, etc., but with the advent of the Wellsworth Lensometer, you will only need a lens and you can see under the microscope, how close they can be.

The Wellsworth in the extreme of its range of magnification is the Wellsworth Lensometer. The resolution of 1/10000th of a millimeter is not enough of scale magnitude that is not to be seen in the Wellsworth, a hacking point of a lens to see the Wellsworth. The Wellsworth is a simple Pucholt design, which enables a lens to be seen and the Wellsworth is a simple Pucholt design.
What Was Done before the Lensometer?

It is difficult today to appreciate the impact of the Lensometer almost a century after its introduction into optical offices. Prior to the Lensometer, optical professionals had no practical method to check if custom-made lenses produced to an individual prescription were of the proper power. Trial lens sets and other refraction methods preceded the Lensometer in opticians’ offices, but verification of prescriptions using them was difficult.

The pre-Lensometer approach was trial and error. Patients tried various power lenses, much like what is done for reading glasses at the pharmacy today. This did not work well with non-spherical lenses and, of course, gave less than ideal correction. Very early, glasses were even dispensed by age category, which again, resulted in a compromised correction for patients.
Importance of the AO Calibration Lens Set to the Lensometer

An important part of the development of the Lensometer was the addition of Edmund Tillyer to AO’s staff. Tillyer had produced a complete set of accurate, standardized lenses for the National Bureau of Standards (NBS) that could be used to check the accuracy of any lens manufactured or distributed. The NBS calibration lenses in the Optical Heritage Museum collection are the only extant set known. AO hired Tillyer because of the expertise he had developed in producing the calibration lenses, and Tillyer would, in turn, use his standardized lenses to calibrate the focimeter, which AO trademarked as the Lensometer and began marketing to optical dispensaries on a large scale in 1921.
This is the AO primary true-power lens set calibrated by Edmund Tillyer when he worked at the National Bureau of standards prior to joining AO.

Each lens was measured for its refractive index. The lens curves were measured and then the resulting power calculated. Two lenses were re-certified in 1977 and had not changed. It is this set by which all AO Lensometers were originally calibrated.
Influence / Use Today

The 1921 Wellsworth Lensometer in the Optical Museum’s collections is the earliest known example of the first focimeter made commercially available on a wide scale to ophthalmologists and opticians. It quickly became a common fixture in optical offices across the country. AO’s success encouraged other companies to develop and market focimeters of their own.

In 2008, the Vision Council Lens Technical Committee undertook a study of the accuracy of commonly used devices for measuring lenses available on the market today. Interestingly, they found that modern commercial lensometers are no more accurate than the Wellsworth Lensometer introduced commercially 100 years ago.

The Optical Heritage Museum

The history and many technical achievements of AO (founded in 1833) are showcased in the Optical Heritage Museum in Southbridge, Massachusetts, the city where AO originated. Among the museum’s extensive holdings are not only the landmark 1921 Wellsworth Lensometer, the first widely used focimeter, but also the laboratory prototypes that preceded it and the improved models that followed. In 2006, AO was incorporated into the larger Carl Zeiss organization, and, today, Zeiss is the primary sponsor of the Optical Heritage Museum.

Zeiss is one of the world’s leading technology companies. It has a balanced portfolio that is geared toward attractive, future-oriented markets in optics, precision mechanics, and optoelectronics. For more than 170 years, Zeiss has been shaping technological progress, advancing the world of optics, and responding to its customers’ requirements.

Further Reading


THE HISTORY AND HERITAGE PROGRAM OF ASME

Since the invention of the wheel, mechanical innovation has critically influenced the development of civilization and industry as well as public welfare, safety and comfort. Through its History and Heritage program, the American Society of Mechanical Engineers (ASME) encourages public understanding of mechanical engineering, fosters the preservation of this heritage and helps engineers become more involved in all aspects of history.

In 1971 ASME formed a History and Heritage Committee composed of mechanical engineers and historians of technology. This Committee is charged with examining, recording and acknowledging mechanical engineering achievements of particular significance. For further information, please visit http://www.asme.org.

LANDMARK DESIGNATIONS

There are many aspects of ASME’s History and Heritage activities, one of which is the landmarks program. Since the History and Heritage Program began, 276 artifacts have been designated throughout the world as historic mechanical engineering landmarks, heritage collections or heritage sites. Each represents a progressive step in the evolution of mechanical engineering and its significance to society in general.

The Landmarks Program illuminates our technological heritage and encourages the preservation of historically important works. It provides an annotated roster for engineers, students, educators, historians and travelers. It also provides reminders of where we have been and where we are going along the divergent paths of discovery.

ASME helps the global engineering community develop solutions to real world challenges. ASME, founded in 1880, is a not-for-profit professional organization that enables collaboration, knowledge sharing and skill development across all engineering disciplines, while promoting the vital role of the engineer in society. ASME codes and standards, publications, conferences, continuing education and professional development programs provide a foundation for advancing technical knowledge and a safer world.

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