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Test methods for optical properties of variable focus liquid lens

液体变焦透镜光学性能测试方法

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Foreword

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Liquid zoom lens is a focus-adjustable lens containing optical liquid, usually driven by electrical signals. When it is loaded into a liquid lens, the shape of the optical liquid changes accordingly, thereby changing the focal length of the lens. Liquid lenses have the advantages of large focal range, small size, fast response speed, low energy consumption, and high precision. They have been applied to machine vision. The zoom range, hysteresis, response time, etc. are important characteristics of liquid zoom lenses. Parameter indicators directly affect the imaging effect. This document provides the test methods for these parameters, which can be used to standardize the performance of such products and provide a reference for product development, testing and application. Technical basis, thereby promoting industrial development. Optical performance test method of liquid zoom lens

1 Scope

GB/T 44455-2024 gives the Chinese test methods for the optical properties of variable focus liquid lenses. A liquid lens changes its focal length by deforming a fluid interface electrically rather than by moving glass, which makes it fast, small and free of moving parts, and has taken it into machine vision, barcode readers, endoscopes and phone cameras. It also makes it behave unlike a fixed lens in ways that only a dedicated method captures: the optical power depends on the drive signal with hysteresis, it settles over a measurable response time, and it drifts with temperature and orientation. The standard sets the test requirements and then each method in turn: the zoom range, the maximum hysteresis between the increasing and decreasing drive curves, the optical power response time, the transmittance curve across the wavelength band, and the further properties of wavefront aberration, resolution, decentration and stability that determine whether the lens can be used in an imaging path. It takes effect on 1 April 2025.

This document describes the test methods for the optical performance of liquid variable focus lenses. This document is applicable to the optical performance test of liquid variable focus lenses.

2 Normative references

This document has no normative references.

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Focal power The reciprocal of the focal length of a lens.

3.2 zoom range f_{range} In the curve of the driving signal and optical power of the liquid

zoom lens, the minimum optical power and the maximum optical power corresponding to the monotonically changing part.

3.3 Maximum hysteresis The liquid zoom lens is configured to be capable of performing a variable focus operation when the drive signal increases from the minimum drive value to the maximum drive value and decreases from the maximum drive value to the minimum drive value. The maximum mismatch between the driving signal and the optical power curve during the process.

3.4 When the liquid zoom lens is within the zoom range, the driving signal responds in a step manner, causing the focal length to jump. The time required.

Note. The stable value means that the difference between adjacent optical powers is no more than 1%.

3.5 Transmittance curve The curve of the transmittance of the liquid zoom lens changing with wavelength.

3.6 Under specified optical focal length, the difference in optical focal length corresponding to different incident wavelengths of the liquid variable focus lens within the working wavelength range.

3.7 The angle at which the normal to the lens reference surface deviates from the optical axis.

Note. For liquid zoom lenses, the reference plane is the plane of the lens package shell.