white-light interference objective

What is a white-light interference objective?

The interference objective is a key component of a white-light interferometer. Compared with laser interferometry, white-light interferometry offers higher measurement accuracy.

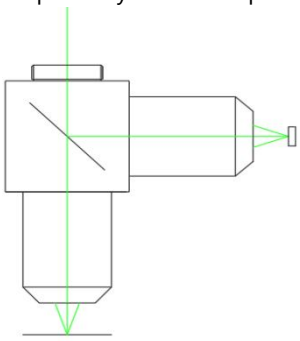
White-light interference objectives are typically used to characterize high-precision 3-D surface topographies—for example, on wafers, optical elements, MEMS , laser-processed parts, photovoltaic components, and precision aerospace or micro-electronic coatings.

By interpreting the interference fringes or using dedicated software, users can extract the relevant 3-D surface-topography parameters.

Classification of White-Light Interference Objectives

All interference objectives currently employed in white-light interferometers fall into three main categories.

Type 1: Linnik-type interference objective, whose schematic is shown below. Its core requirement is two identical microscope objectives with perfectly matched optical paths.

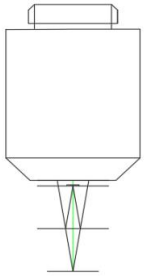


Linnik objective

Linnik objective

Website

Type 2: Mirau Objective. In a Mirau objective, the reference mirror and beam-splitting unit of the interferometer are integrated into the front end of the microscope objective. The reference mirror occupies the central portion of the field of view and is coated with a highly reflective film, while the beam-splitter plate is positioned at the very front. The distance from the reference mirror to the beam-splitter plate is exactly equal to the distance from the beam-splitter plate to the surface under test.

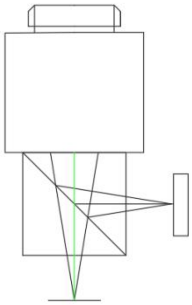


Mirau Objective

Mirau Objective

Website

Type 3: Michelson interference objective (Michelson objective). A beam-splitter is placed in front of a long-working-distance microscope objective, while the reference mirror is moved to the side of the objective. This configuration is typically used in white-light interferometric applications at 5× magnification or lower.



Michelson objective

Michelson objective

Website

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Optical design	Mirau	Mirau	Mirau	Mirau
Magnification	10X	10X	20X	50X
NA	0.25	0.3	0.4	0.55
Parfocal Distance(mm)	45	45	45	45
WD(mm)	7.4	7.4	3.7	4
Focal(mm)	20	20	10	4
DoF(μm)	10	10	3.5	1.4
Resolution (μm)	1.34	1.34	0.8	0.61
Field Number(mm)	25	25	25	25
1/2′ CCD+F200	0.65x0.45 (φ0.8)	0.65x0.45 (φ0.8)	0.33x0.23 (φ0.4)	0.13x0.09 (φ0.16)
1/2′ CCD+F200+0.5X	1.3X0.9 (φ1.6)	1.3X0.9 (φ1.6)	0.65X0.45 (φ0.8)	0.26X0.18 (φ0.32)
Outer Diameter (mm)	28	30	28	27.6
Weight(g)	85	114	102	110
Thread Type/Mount	4/5x1/36′ (RMS、M20.32X0.7055)			

Optical design	Linnik		
Magnification	5X	10X	
NA	0.12	0.25	
WD (mm)	22	17	
Parfocal Distance (mm)	80	80	
Field Number(mm)	25	25	
1/2′ CCD+F200	1.3x0.9 (φ1.6)	0.65x0.45 (φ0.8)	
1/2′ CCD+F200+0.5X	2.6X1.8 (φ3.2)	1.3X0.9 (φ1.6)	
Thread Type / Mount	4/5x1/36′ (RMS、M20.32X0.7055)		

Optical design	Michelson
Magnification	5X
NA	0.15
WD (mm)	8
Parfocal Distance (mm)	48.5
Field Number (mm)	25
1/2′ CCD+F200	1.3x0.9 (φ1.6)
1/2′ CCD+F200+0.5X	2.6X1.8 (φ3.2)
Thread Type / Mount	4/5x1/36′ (RMS、M20.32X0.7055)

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