

---

# NIKON CF<sup>®</sup> OBJECTIVES

## 210mm TUBE LENGTH

### for Industrial Applications

---



- REFLECTED LIGHT BRIGHTFIELD
  - REFLECTED BRIGHT/DARKFIELD
  - REFLECTED POLARIZED LIGHT AND NOMARSKI TECHNIQUES
  - PETROGRAPHIC APPLICATIONS
  - INTERFEROMETRY
-

## CF® BRIGHTFIELD REFLECTED LIGHT OBJECTIVES

CF M Plan Achromats and CF M Plan Apochromats provide exceptional clarity, contrast and flatness when used in viewing metallurgical, electronic, and other opaque specimens. They are flatfield from edge to edge, permitting ultra-wide observation with identical sharpness from center to edge. The complete line of reflected light objectives includes the ELWD and SLWD series which are invaluable for inspecting IC's in packages. For critical examination of specimens, use the high-resolution CF M Plan Apochromats.



Objective Type	Magnification	Product Number	Numerical Aperture	Working Distance mm	Focal Length mm	Price
CF M Plan Achromat	<sup>1</sup> <sup>2</sup> 1X	78777	0.03	10.2	207.20	\$2,794.00
	<sup>2</sup> 1.5X	78762	0.045	3.6	125.8	3,029.00
	<sup>2</sup> 2.5X	78760	0.075	11.0	76.68	1,079.00
	5X	78731	0.10	20.0	37.64	524.00
	10X	78732	0.25	9.0	21.19	692.00
	20X	78733	0.40	2.7	10.0	752.00
	40X	78734	0.65	1.0	5.26	868.00
	60X	78735	0.80	0.30	3.72	1,118.00
	100X	78737	0.90	0.30	2.13	1,485.00
	LWD 20X	78729	0.40	6.0	10.1	1,108.00
	LWD 40X	78730	0.55	3.0	5.19	1,385.00
	LWD 100X	79235	0.90	1.00	2.04	2,892.00
	ELWD 20X	78775	0.40	10.5	11.1	1,145.00
	ELWD 40X	78776	0.50	10.1	5.1	1,277.00
	ELWD 60X	79233	0.70	4.90	3.49	2,292.00
	ELWD 100X	79237	0.80	2.0	2.04	4,329.00
	SLWD 10X	79295	0.21	20.4	20.56	1,149.00
SLWD 20X	79296	0.35	19.9	9.94	1,637.00	
SLWD 40X	79297	0.40	14.9	5.10	2,124.00	
SLWD 100x	79299	0.75	4.7	2.01	4,223.00	
100X Oil	78736	1.25	0.23	2.23	1,868.00	
CF M Plan Achromat Suitable for surface inspection of optical disks	50X PC w/corr	79248	0.7	2.9	4.34	6,199.00
	100X PC w/corr	79249	0.8	1.0	2.07	6,199.00
	50X PMMA w/corr	79288	0.7	2.6	4.31	6,199.00
	100X PMMA w/corr	79289	0.8	1.0	2.06	6,199.00
CF M Plan Apochromat	40X	78860	0.80	0.70	5.2	2,073.00
	50X	78738	0.90	0.22	4.24	2,880.00
	100X	79242	0.95	0.32	2.0	3,625.00
	150X	79243	0.95	0.20	1.4	3,334.00
	200X	79244	0.95	0.20	1.4	3,855.00

<sup>1</sup>78777 1X objective must be used in conjunction with 79503 polarizer and 79504 analyzer in order to achieve anti-glare reflex performance built into this objective.

The objective has a dovetail mount, no nosepiece required.

<sup>2</sup>Will vignette with 10x UW eyepieces.

## CF BRIGHT/DARKFIELD OBJECTIVES FOR REFLECTED LIGHT

The BD Plan Achromats and BD Plan Apochromats furnish the best of brightfield and darkfield methods in one. Darkfield is a popular method for locating scratches or inclusions on the surface of opaque specimens. Designed for use on the B/D Nosepiece, light from the specimen travels through the objective barrel, thus providing excellent contrast in darkfield. All objectives are dry, and, thus, easy to handle because there is no need for immersion oil.



Objective Type	Magnification	Product Number	Numerical Aperture	Working Distance mm	Focal Length mm	Price	
CF BD Bright/Darkfield Plan Achromat	5X	78740	0.10	9.0	37.64	\$ 638.00	
	10X	78741	0.25	3.0	21.19	823.00	
	20X	78742	0.40	2.5	10.0	923.00	
	40X	78743	0.65	1.0	5.26	1,048.00	
	50X	78763	0.85	0.56	4.12	1,387.00	
	60X	78753	0.80	0.35	3.72	1,288.00	
	100X	78754	0.90	0.39	3.49	2,023.00	
	ELWD 20X	78861	0.4	8.50	11.60	1,230.00	
	ELWD 40X	78862	0.5	9.80	5.26	1,578.00	
	ELWD 60X	79234	0.70	4.90	3.49	2,441.00	
	LWD 100X	79236	0.90	1.00	2.04	3,021.00	
	ELWD 100X	79238	0.80	2.0	2.04	4,605.00	
	CF BD Bright/Darkfield Plan Apochromat	40X	79290	0.8	0.7	5.2	2,989.00
		100X	79292	0.9	0.43	2.0	3,945.00
150X		79293	0.9	0.3	1.4	3,898.00	
200X		79294	0.9	0.3	1.03	4,475.00	

## CF BD/DIC M PLAN ACHROMATS

CF BD/DIC M Plan Achromats are the most versatile metallurgical objectives available. They are designed to perform brightfield, darkfield, polarized light & Nomarski techniques, thus eliminating the need for separate objectives for each technique. The CF BD/DIC M Plan Achromats are dry, eliminating the need for oil.



Objective Type	Magnification	Product Number	Numerical Aperture	Working Distance mm	Focal Length mm	Price
CF BD/DIC	5X	78870	0.10	9.0	37.64	\$ 685.00
M Plan	10X	78871	0.25	3.0	21.19	908.00
Achromat	20X	78872	0.40	2.5	10.0	1,036.00
	40X	78873	0.65	1.0	5.26	1,198.00
	50X	78764	0.85	0.56	4.12	1,555.00
	100X	78874	0.90	0.39	2.13	2,197.00

## CF M PLAN DIC OBJECTIVES FOR REFLECTED LIGHT

CF M Plan DIC objectives are designed for reflected Normarski DIC system and standard polarized light. These strain free objectives help minimize the depolarization effects. They also offer a remarkably high EF (extinction factor). The reflected Normarski DIC system is used to gain surface relief that is not attainable with brightfield. Since all DIC objectives are dry type, immersion oil is not necessary.



Objective Type	Magnification	Product Number	Numerical Aperture	Working Distance mm	Focal Length mm	Price
CF DIC	5X	78852	0.10	20.0	27.6	\$ 575.00
M Plan	10X	78853	0.25	9.0	21.2	830.00
Achromat	20X	78854	0.40	2.7	10.0	922.00
	40X	78855	0.65	1.0	5.3	1,152.00
	100X	78856	0.90	0.3	2.1	2,208.00

Note: When using any M-Plan objective in a BD or Universal Nosepiece, the 78797 objective adapter must be used.

## CF M FLUOR AND CF PM FLUOR OBJECTIVES FOR REFLECTED LIGHT

Characteristic of the M Fluor Achromat series of objectives are the extremely high transmission capabilities for all wavelengths, i.e. 60% in the 340nm range and ultra high numerical apertures signifying increased resolving power. These two features allow these objectives to be used reliably for lithography applications. Their high light gathering ability also allows these lenses to perform beautifully during low level fluorescence.

The most common application for the PM Fluor 20X and 40X oil immersion objectives are in the Coal/Oil Industry. Petroleum geologists use them for vitrinite testing with a reflected light microscope photometer system. They are excellent for all polarized reflected light applications, especially for conoscopy of low reflectance specimens.



Objective Type	Magnification	Product Number	Numerical Aperture	Working Distance mm	Focal Length mm	Price
CF M Fluor Achromat*	14X	79305	0.50	0.64	14.3	\$1,475.00
	26X	79306	0.75	0.66	7.8	1,677.00
	50X	79307	0.85	0.45	4.16	2,054.00
CF PM Fluor Achromat	20X	78770	0.60	0.40	10.7	1,598.00
	40X	78771	1.00	0.41	5.5	2,007.00

\*79308 UV Cut Slider is recommended for use with CF M Fluor objectives. The price is \$29.00

## NOMARSKI PRISMS FOR DIFFERENTIAL INTERFERENCE CONTRAST

Prism Part Number	Nomarski Prism	Price	Objective
79537	5x	\$ 529.00	For 5X #78852, 78870
79538	10/100x	529.00	For 10X #78853, 78871, 100X #78856, 78874
79539	20x	529.00	For 20X #78854, 78872
79540	40x	529.00	For 40X #78855, 78873
79568	50x	529.00	For 50X #78764
79541	A/1	683.00	For 100X #79235, 79237, 79242, 79236, 79238, 79292 200X #79294
79542	B/2	683.00	For 40X #78730, 78862
79543	C/3	683.00	For 40X #78860, 79290 60X #79234
79544	D/4	683.00	For 20X #78861 60X #78735, 78753
79545	E/5	683.00	For 150X #79243, 79293

## CF DI AND CF MI INTEROMETRY OBJECTIVES FOR REFLECTED LIGHT

CF Interference objectives are used in determining height differences of reflected light specimens.

DI double beam (Mirau) and TI (Michaelson) objectives make no contact with the specimen. Measuring accuracy is 1/10 of the wavelength used (approximately 50-60nm with 550 GIF filter). The new TI series 2.5 and 5x allow low power interferometry over larger areas and have a built-in 2° tilting mirror.

The MI multiple beam (Tolansky) objectives provide higher measuring accuracy, down to 1/100 of the wavelength (approximately 5nm with 540 IF Narrow band filter), due to their sharper fringes. They utilize a reference mirror which must be brought into direct contact with the specimen.



Objective Type	Magnification	Product Number	Numerical Aperture	Working Distance mm	Focal Length mm	Price
CF DI & TI Non Contact Interferometry	DI 10X	79100	0.25	4.0	21.3	\$ 908.00
	DI 20X	79101	0.40	1.9	10.1	1,118.00
	DI 40X	79138	0.50	3.9	5.1	2,153.00
	TI 2.5X*	79283	0.075	11.1	77.8	4,423.00
	TI 5X*	79284	0.1	9.0	37.7	2,298.00
CF MI Contact Interferometry	MI 10X	79102	0.25		21.3	809.00
	MI 20X	79103	0.40		10.1	953.00
	MI 40X	79139	0.50		5.1	2,001.00
<b>Reference Mirrors for MI objectives</b>	79104	4% ref. mirror for 10X & 20X MI objectives				105.00
	79105	40% ref. mirror for 10X & 20X MI objectives				105.00
	79106	65% ref. mirror for 10X & 20X MI objectives				105.00
	79107	90% ref. mirror for 10X & 20X MI objectives				105.00
	79143	4% ref. mirror for 40X MI objectives				131.00
	79140	40% ref. mirror for 40X MI objectives				123.00
	79141	65% ref. mirror for 40X MI objectives				123.00
	79142	90% ref. mirror for 40X MI objectives				123.00
	79109	Ref. mirror holder for MI objectives				144.00

\*These objectives have a dovetail mount, no nosepiece required.

### NOTES:

- Use 79083 IF narrow band green (540nm) filter for MI objectives.
- Use 79082 GIF green filter for DI and TI objectives.
- TI objectives are not parfocal with other CF objectives.  
Parfocal distance TI 2.5x = 7.94mm (not useable on IC-66)  
TI 5x = 48.6mm
- TI objectives supplied with single objective adapter or can be mounted on 79025 BD nosepiece.
- Use 79108 CFS 10x eyepiece (FN 12) with MI and DI to restrict field of view to area with fringes.

## EYEPIECES

CF High eyepoint widefield eyepieces are the standard, designed to be used with all objectives. For a super widefield of view, there are the CF high eyepoint ultra-widefield eyepieces which are designed to be used with a special ultra-wide head.

In addition, a filar micrometer eyepiece is available which offers easy calibration and extremely accurate readings down to 0.01mm. The filar may be used with CF objectives from 2.5X to 100X.



CF Eyepiece Type	Magnification	Product Number	Field Number mm	Focal Length mm	Price
CF-E High-Eyepoint Widefield*	CF-E 5X	78415	18.6	40.0	\$ 76.00
	CFW-E 10X	78416	18.0	25.0	52.00
	CFW-E 15X	78417	16.7	16.7	76.00
CF High Eyepoint Widefield	CFWN 8X	84225	20.0	31.3	266.00
	CFWN 10X	84220	20.0	25.0	172.00
	CFWN 10X PM	84221	20.0	25.0	271.00
	CFWN 10X CM	84268	18.0	25.0	308.00
	CFWN 10X CR	84228	18.0	25.0	366.00
	CFS 10X	79108	12.0	25.0	141.00
	CFWN 12.5X	84226	16.0	20.0	426.00
	CFWN 15X	84227	14.0	16.7	182.00
CF High Eyepoint Ultra Widefield	CFUWN 10X	84222	26.5	25.0	468.00
	CFUWL 10X	81530	25.0		548.00
	CFUWN 10X PM	84223	26.5	25.0	641.00
	CFUWN 15X	84249	17.5	25.0	1,054.00

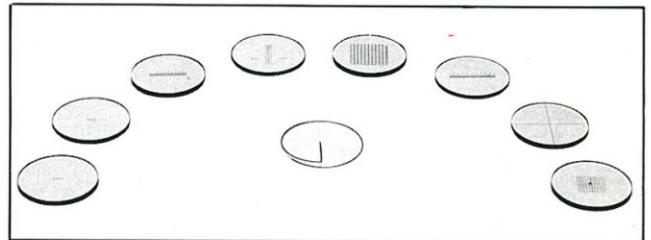
\*For BJ and FJ Body Tubes only.

## RETICLES

To accommodate your needs, Nikon offers a full range of reticles for quantitative and qualitative measurement.

### RETICLES 21.0mm

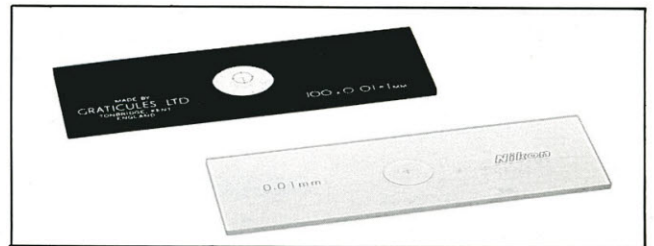
Fits built-in reticle holder of most CFWN eyepieces.



Description	Product #	Price
.1 inch scale in 100 graduations	SO75950	\$ 58.00
.5 inch scale in 100 graduations	SO75955	58.00
5mm scale in 100 graduations	SO75960	58.00
10mm scale in 100 graduations	SO75961	58.00
1mm squares	SO75962	58.00
5mm squares	SO75963	58.00
Crossline 90°	SO75966	58.00
Whipple Disc	SO75967	58.00
Eyepiece Pointer	76960	5.00

## STAGE MICROMETER

Extremely accurate calibration is afforded with a choice of three stage micrometers.



Description	Product #	Price
Stage Micrometer A 1mm scale divided into 100 parts	76954	\$106.00
Stage Micrometer B .2mm scale with 400 squares	76955	106.00
Stage Micrometer for reflected light .04 inch in 40 parts (0.001 inch) Manufactured with equipment traceable to N.I.S.T. standards	75626	265.00

Product No.	Description	Price	Product No.	Description	Price
<b>ACCESSORIES</b>					
76997	Lens cleaning tissue - 50 sheets	\$ 3.00	84236	Filar micrometer eyepiece adapter for ultra wide body tubes	\$162.00
76999	Immersion oil 8cc (PCB free)	5.00	84229	Rubber eyecup for CFWN 10X eyepiece	4.00
77001	Immersion oil 50cc (PCB free)	20.00	85514	Rubber eyecup for UW eyepieces	5.00
77002	Immersion oil 500cc (PCB free)	138.00	79445	CF objective lens case	5.00
78797	BD/RMS adapter - for using M-plan objectives on a BD or Universal nosepiece	51.00	79308	UV Cut-off slider	29.00
79136	160-210 adapter - for using 210mm objectives without epi-illuminator	123.00	79470	0.03mm shim	3.00
84235	Filar Micrometer eyepiece - 10mm in 100 parts	1,304.00	79471	0.05mm shim	3.00
			84219	Reduction ring for UW eyepiece tubes	50.00



50X and 100X PMMA CF M Plan Objectives

To find depth of focus, use this formula:

$$\text{Depth of Focus} = \frac{n \times \lambda}{2 \times (\text{N.A.})^2} + \frac{n}{7 \times \text{N.A.} \times M}$$

To find resolving power, use this formula:

$$\text{Resolving power} = \frac{\lambda}{2 \times \text{N.A.}}$$

Where n = Refractive index

Where  $\lambda$  = 0.55  $\mu\text{m}$  standard wavelength

## DESIGNATIONS ON OBJECTIVES AND EYEPIECES

LWD - Long working distance  
 ELWD - Extra long working distance  
 SLWD - Super long working distance  
 w/corr - With correction collar for coverslip or coating thickness  
 M - Metallurgical objectives (210mm)  
 DI - Interferometry; double beam, Mirau  
 TI - Interferometry; multiple beam, Michaelson  
 MI - Interferometry; multiple beam, Tolansky  
 DIC - Differential Interference Contrast  
 PM - For polarized light; reflected  
 PLAN - Flat field  
 Fluor - High UV transmission

PC - Objective used for viewing specimen with polycarbonate surface film layer  
 PMMA - Objective used for viewing specimen with polymethyl methacrylate surface film layer  
 CFWN - High eyepoint widefield eyepiece  
 CFUWN - High eyepoint ultra widefield eyepiece  
 PM - Eyepiece designation-photomask reticle  
 CM - Eyepiece designation-crossline reticle for polarizing microscope  
 CR - Eyepiece designation-concentric circles for photometer  
 CFS - Eyepiece designation for use with MI and DI objectives

When cleaning objectives and eyepieces use fresh, anhydrous xylene and lens paper.

All prices are suggested selling prices.  
 Price and specifications subject to change without notice.

**SMI** SOUTHERN MICRO  
 INSTRUMENTS  
*Focus On The Leader*

ATLANTA, GEORGIA 30339-2103

1-800-241-3312 FAX 404-953-4490

nt Group  
 Road  
 064

### Regional Offices:

Mid Atlantic: 7501 Standish Pl., Rockville, MD 20855, (301) 294-0090  
 Southeast: 5355 Oakbrook Pkwy., Norcross, GA 30093, (404) 564-2391  
 Midwest: 8120 Lehigh Ave, Suite 103, Morton Grove, IL 60053, (708) 581-9300  
 Southwest: 1600 Corporate Ct., Las Colinas Park, Irving, TX 75038, (214) 550-0046  
 West Coast: 19601 Hamilton Ave., Torrance, CA 90502, (310) 516-7124