新特光电
Sintec Optronics

25 mm lens with integrated EL-3-10

Test report of ELM-25-5.6-9-S

Summary

- Versatile, affordable focusing solution for sensors up to 1/1.7”
- High resolution for 2.4 um pixels:
  - Close to Nyquist resolution of 193-208 lp/mm in the center and edges over large working distance ranges
  - Great Polychromatic performance: no difference between blue and white light
  - Field Curvature appears only slightly at the corners, but can easily be corrected by re-focusing
- Angular Field of View [°]

AFOV Type \ WD	800 mm	500 mm	300 mm	150 mm
Width	16.9	17.1	16.4	16.9
Height	11.3	11.5	11.0	11.3
Diagonal	20.3	20.5	19.6	20.3

WD [mm]	HFOV [mm]
800	238
500	150
300	86
150	45

- Works for S-mount cameras & C-mount cameras with adapter

Optimized performance based on your application

- Depending on the desired application, the zero-current working distance can be optimized by changing the flange focal distance (by screwing/unscrewing the C-to-S-Mount adapter)
- This way, field curvature effects can be greatly reduced so that performance is good and uniform across the whole field of view (witout any need to selectively refocus)

Examples

- «**Macro-like**» case: set the zero-current WD to 225 mm (middle of 150-300 mm range)

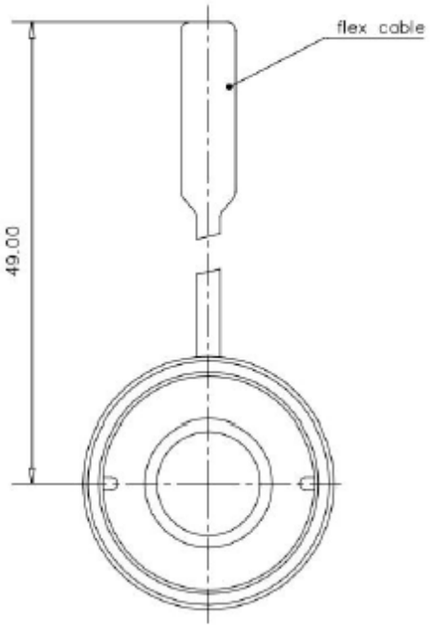
WD	Resolution (lp/mm)		
	Center	Edge	Corner
150 mm	208	185	185
300 mm	208	185	185

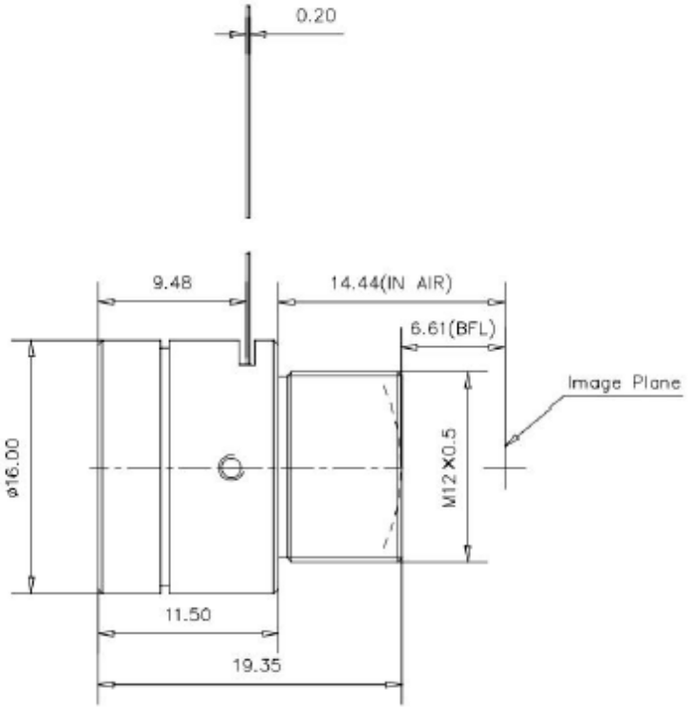
- «**Long-range**» case: set the zero-current WD to 650 mm (middle of 500-800 mm range)

WD	Resolution (lp/mm)		
	Center	Edge	Corner
500 mm	205	205	182
800 mm	205	183	183

ELM-25-5.6-9-S Datasheet

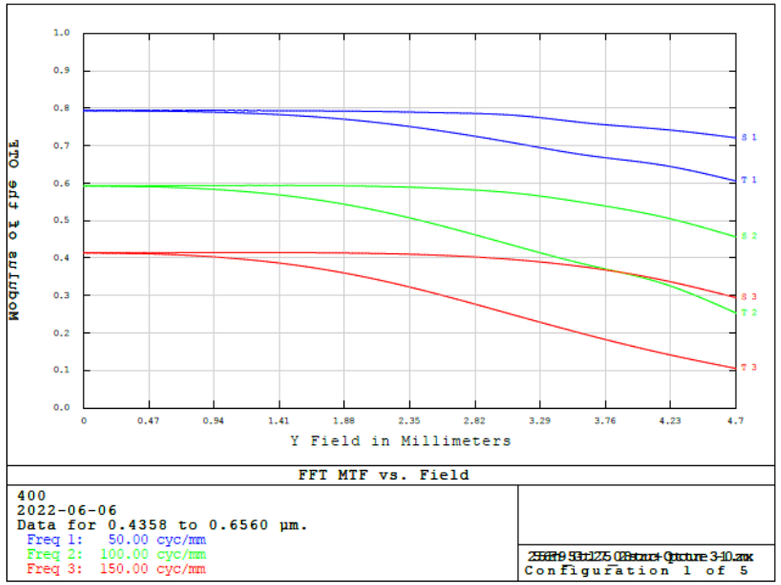
Specifications		
Effective focal length (mm)		25
F NO.		F5.6
Sensor ø(mm)		9.4(1/1.7")
FOV Angle	Diagonal (9.25 mm)	20.35°
	Horizontal(7.4 mm)	16.30°
	Vertical (5.5 mm)	12.13°
Back Focal Length (mm)		6.61
Flange Distance (mm)		14.44
Optical Distortion		<0.8%
Wavelength range (nm)		435-656
Relative illumination		>97%
Max chief ray angle		<6.2°
Working distance (mm)		150-infinity
Mount		M12x0.5
Connector type		FPC(2 pins)
Total Track Length (Liquid Lens included) (mm)		25.94
Size (mm)		ø16×19.35
Focus tunable lens specifications		EL-3-10-VIS-26D-FPC
Focal power range at 20°C (dpt)		-13 to +13
Wavefront error at 525 nm (vertical/horizontal) (λRMS)		<0.2 / <0.2
Working Temperature		-20°C～+65°C
Storage Temperature		-50°C～+85°C
Temperature compensation		No



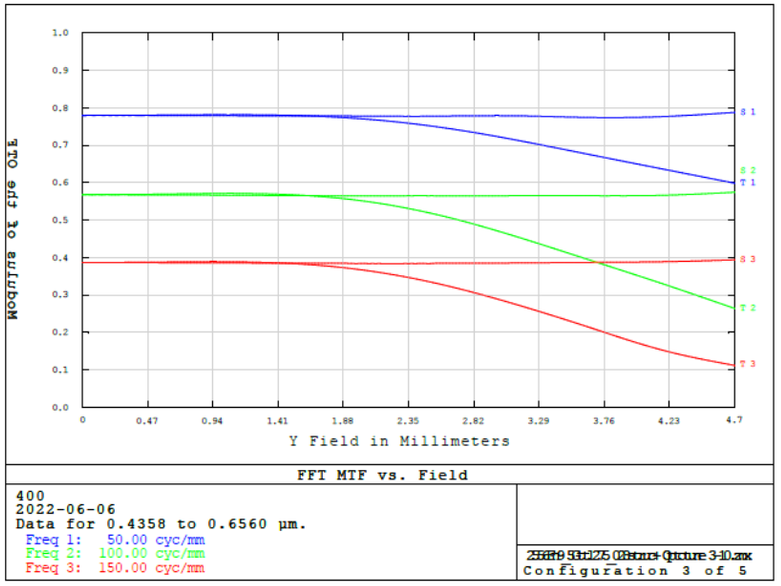


Good nominal MTF values at different working distances

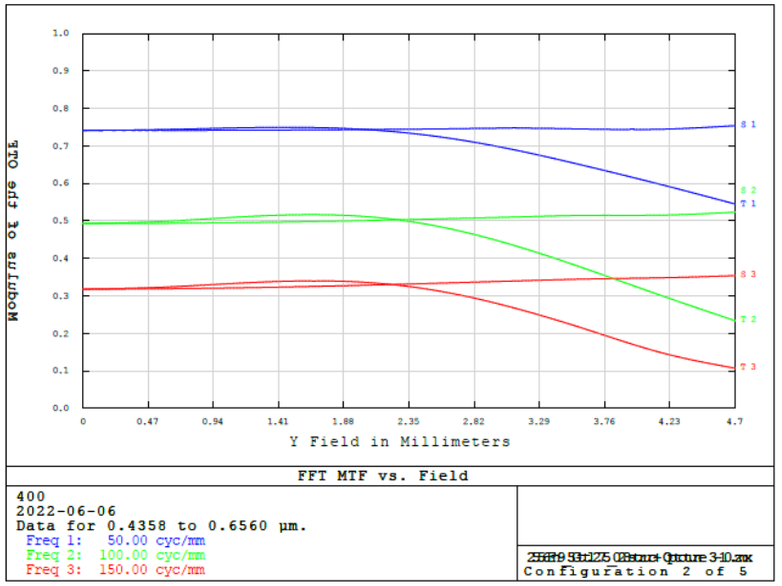
180mm



300mm
(WD with best nominal performance)



400mm



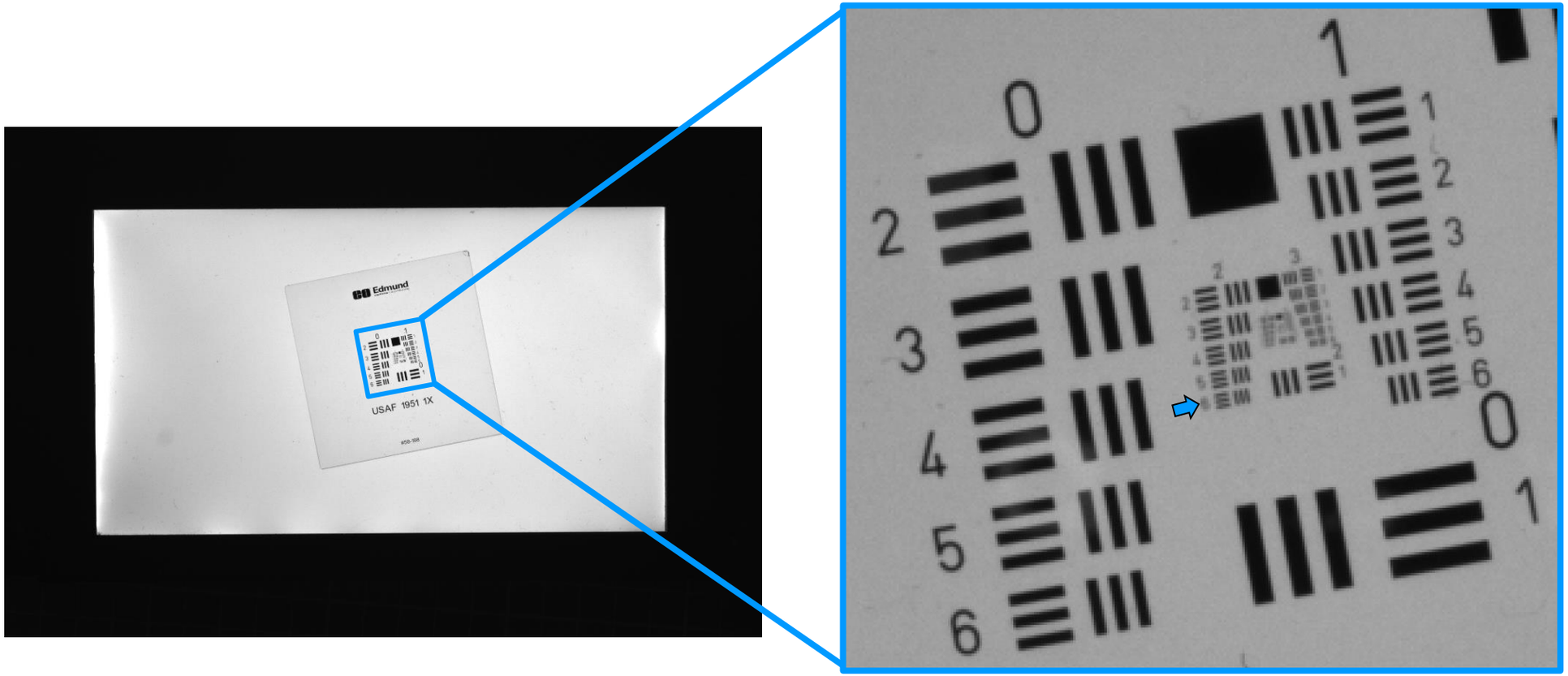
Field of view with 1/1.8” sensor

Image size (2.4 um px):

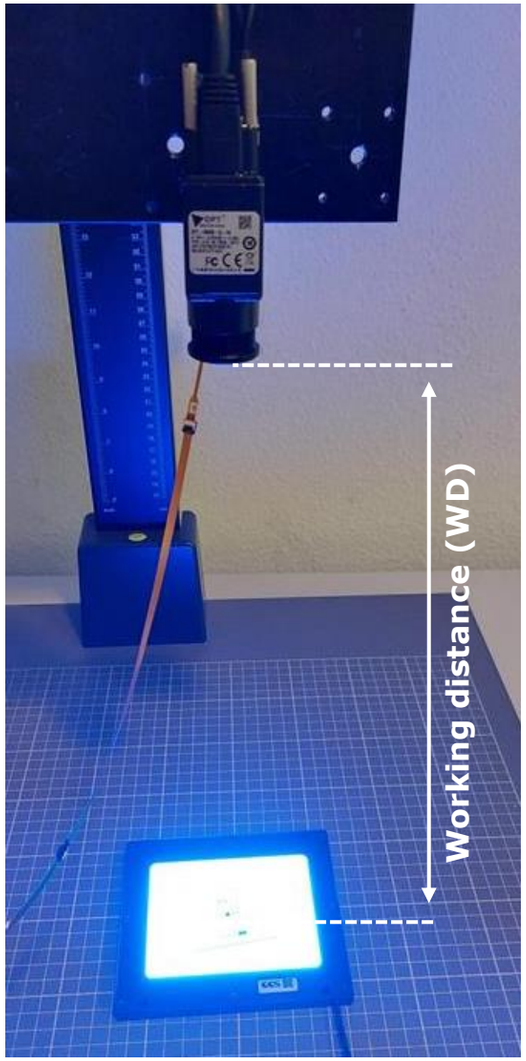
- Width = 7.37 mm
- Height = 4.9 mm
- Diagonal = 8.86 mm

Method for image evaluation

- After acquisition, images are zoomed in to show resolution limited element



Test setup



Camera:	OPT-CM600-GL-0402 1/1.8“, 3072 x 2048 px Pixel size = 2.4 um S to C-mount adapter
Lens:	ELM-25-5.6-9 with EL-3-10-VIS-26D-FPC embedded
Orientation:	Vertical Optical Axis
Driver:	Optotune ICC-4C
Target:	USAF chrome target, transparent
Light:	Blue backlight (LFL-100BL2, 470 nm)

WD 150 mm “Macro”
Performance is close to Nyquist in the center

Camera

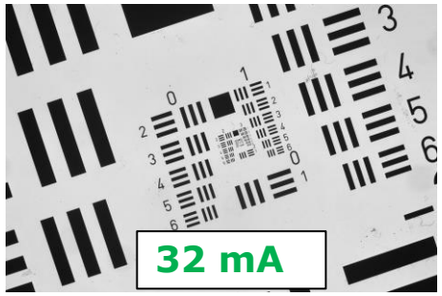
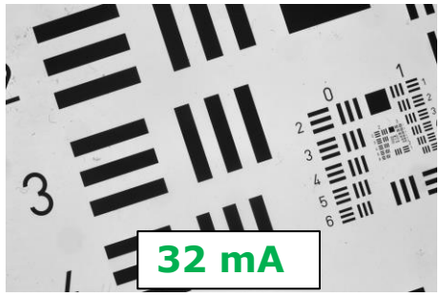
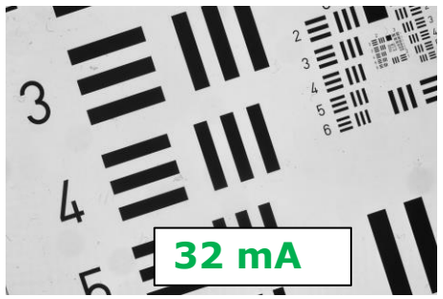
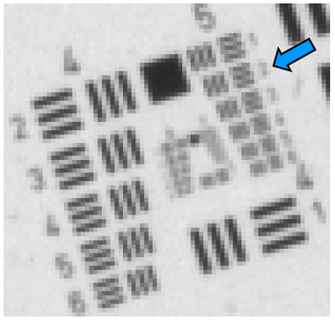
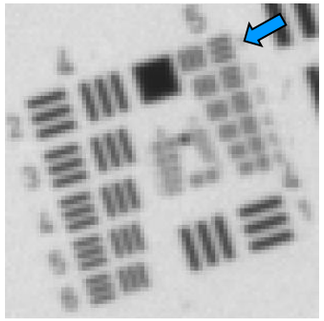
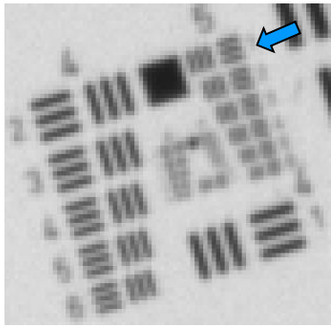
Sensor size = 3072 x 2048 px

Nyquist limit = 208 lp/mm

Pixel size = 2.4 um

Light

Blue background illumination

	Center	Edge	Corner
			
			
USAF element:	5/2	5/1	5/1
Line width (um):	13.92	15.63	15.63
Lp/mm (object):	36	32	32
Magnification:	0.173	0.173	0.173
Lp/mm (image):	**208**	**185**	**185**

Note: Module was initially focused manually at 225mm WD @0mA

WD 300 mm “Macro”

Performance is close to Nyquist in center and edge without refocusing

Camera

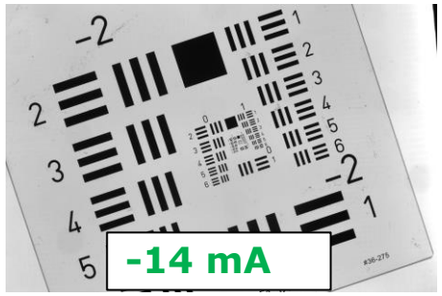
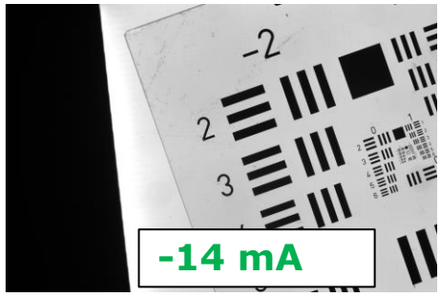
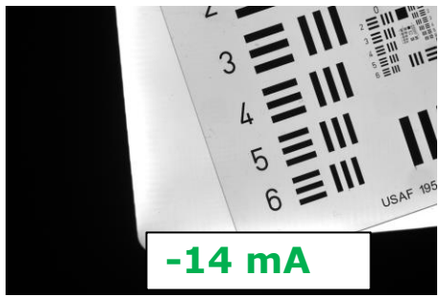
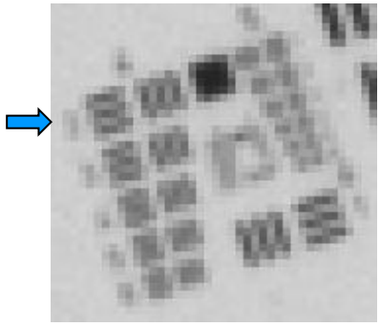
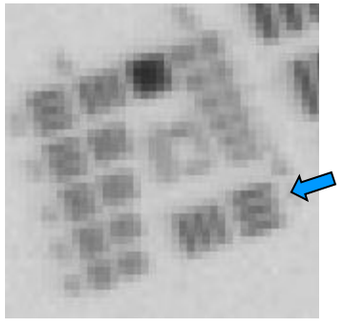
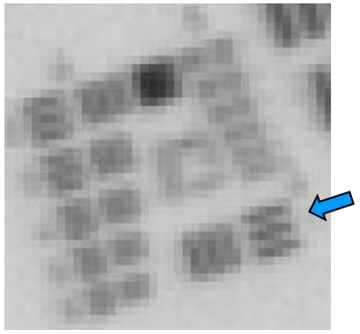
Sensor size = 3072 x 2048 px

Nyquist limit = 208 lp/mm

Pixel size = 2.4 um

Light

Blue background illumination

	Center	Edge	Corner
			
			
USAF element:	4/2	4/1	4/1
Line width (um):	27.84	31.25	31.25
Lp/mm (object):	18	16	16
Magnification:	0.087	0.087	0.087
Lp/mm (image):	**208**	**185**	**185**

Note: Module was initially focused manually at 225mm WD @0mA

WD 500 mm “long-range”

Performance is Nyquist-resolved in center and edge without refocusing

Camera

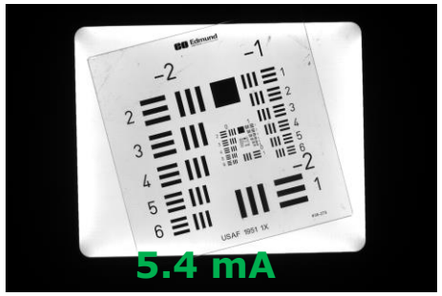
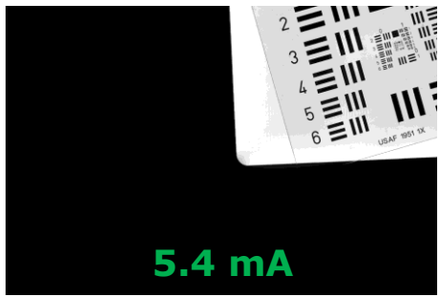
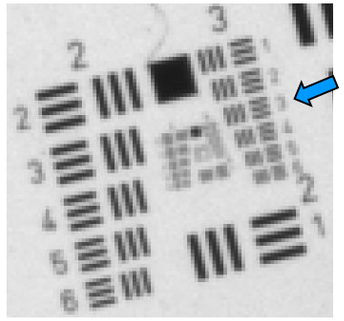
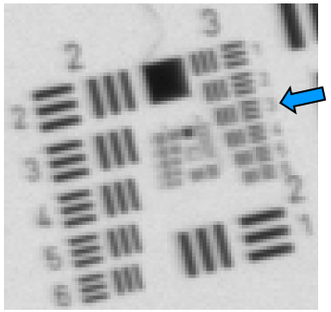
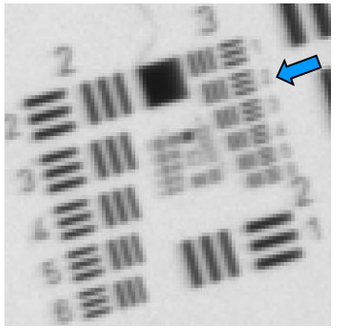
Sensor size = 3072 x 2048 px

Nyquist limit = 208 lp/mm

Pixel size = 2.4 um

Light

Blue background illumination

	Center	Edge	Corner
			
			
USAF element:	3/3	3/3	3/2
Line width (um):	49.61	49.61	55.68
Lp/mm (object):	10	10	9
Magnification:	0.049	0.049	0.049
Lp/mm (image):	**205**	**205**	**182**

Note: Module was initially focused manually at 650mm WD @0mA

WD 800 mm “long-range”

Performance is Nyquist-resolved in center and edge without refocusing

Camera

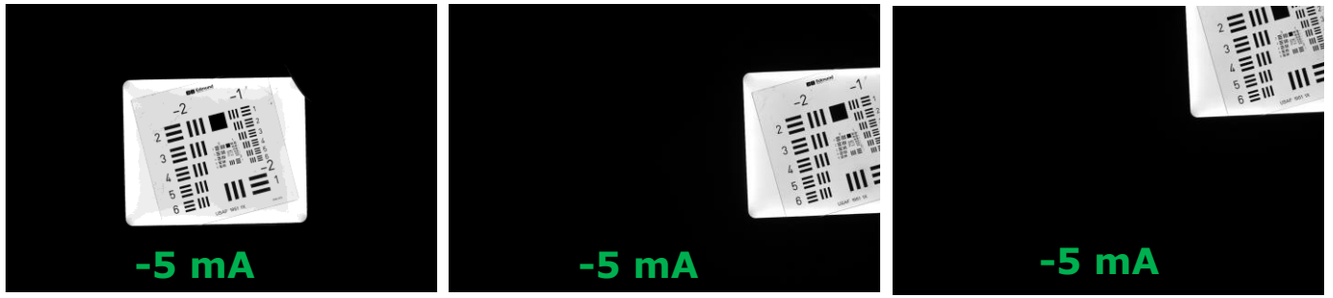
Sensor size = 3072 x 2048 px

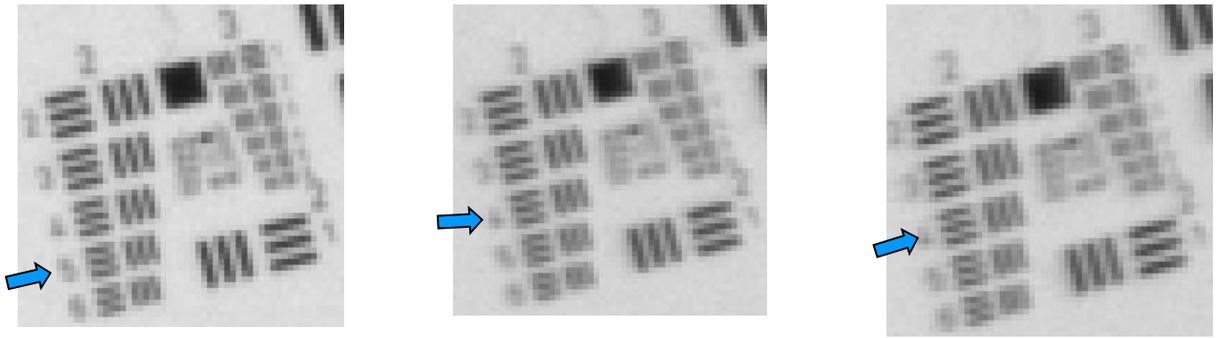
Nyquist limit = 208 lp/mm

Pixel size = 2.4 um

Light

Blue background illumination





USAF element:	2/5	2/4	2/4
Line width (um):	78.75	88.39	88.39
Lp/mm (object):	6	6	6
Magnification:	0.031	0.031	0.031
Lp/mm (image):	**205**	**183**	**183**

Note: Module was initially focused manually at 650mm WD @0mA