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5 mm lens with integrated EL-3-10

Test report of Optotune ELM-5-5.0-7-S (Evetar E3250C)

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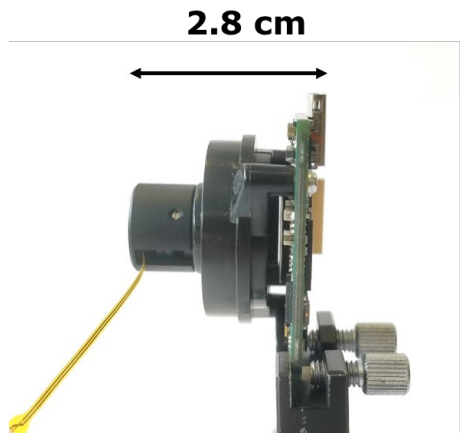
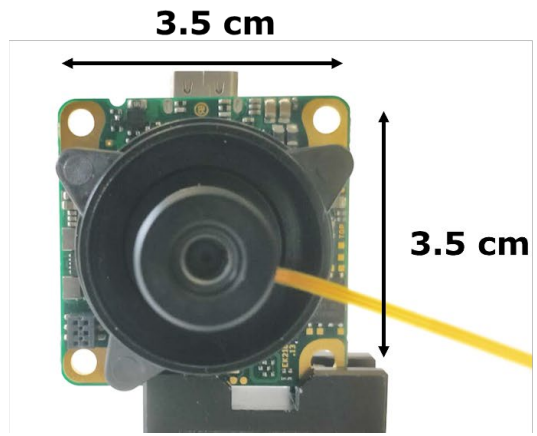
Compact, cost effective lens for many applications

- In combination with board level camera, a **full imaging system with:**

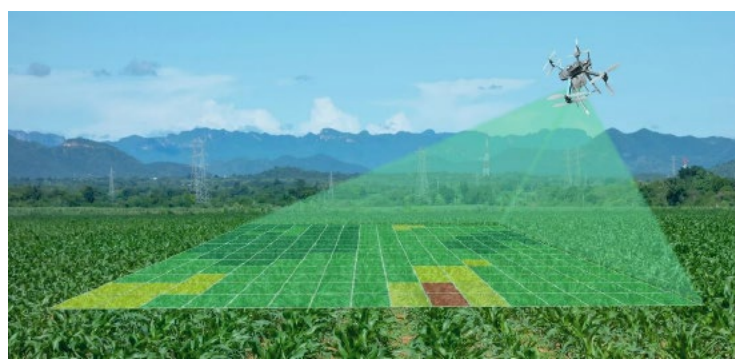
  - ✓**Ultra compact form factor**
  - ✓**Ultra light weight (~20 grams)**
  - ✓**Autofocus**
  - ✓**Large Working distance range**
  - ✓**Large Field of View**

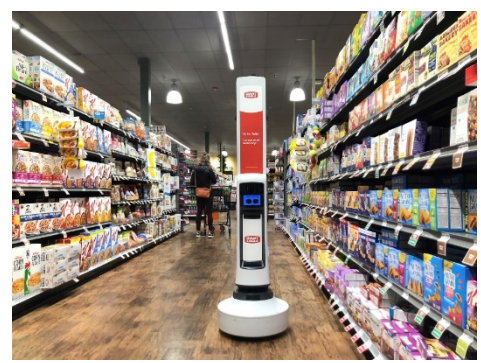




- **Cost effective** solution for many applications:

  - ✓**Drones**
  - ✓**Robot Vision**
  - ✓**Packet sorting**
  - ✓**Bin picking**





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Summary

- **Large Field of View and large working distance (WD) range**
  - From 50 mm to infinity

WD / AFOV	500 mm	130 mm	60 mm
Width	57°	60°	61°
Height	53°	56°	56°
Diagonal	74°	76°	77°

- **High resolution** for 2.4 um pixels:
  - **Nyquist limit** (up to 208 lp/mm) in the center of the FOV
  - Corners and edges between 113-159 lp/mm

- Field curvature on the edges and corners **can be compensated** by **changing the optical power of the liquid lens**

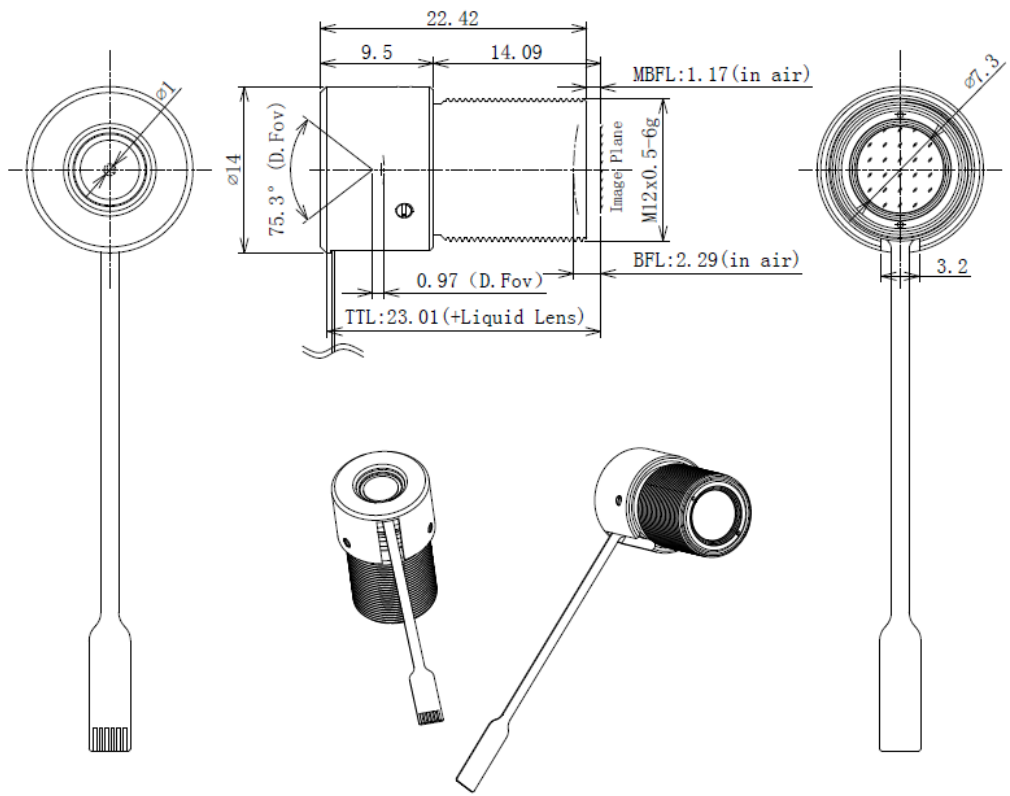
ELM-5-5.0-7-S datasheet

Model No. 型号	E3250C

EVETAR®

SPECIFICATION SHEET

Sensor Spec 传感器规格		1/2.5″ CCD/CMOS 5.75x4.31,7.18
Max Image Circle 最大像面		Ø7.4mm
EFL 有效焦距		5.0mm
FNo. F值		5.0
F.O.V. 视场角	D.对角	75.3°
	H.水平	62.5°
	V.垂直	48.1°
Back Focal Length 后截距		2.29mm(in air)
Lens Effective Diameter 通光口径	Front 前面	Ø1mm
	Back 后面	Ø7.3mm
Lens construction 镜头组成		7-5(+Liquid Lens)
OP Distortion 光学 畸变		<-6.9%
Resolution 分辨率		Mega Pixel
Relative Illumination 相对照度		>30%
Iris 光圈		Fixed
Max Chief Ray Angle 最大主光线入射角		1.0°
M.O.D 最近物距		50mm
Working Distance 工作物距		INF
Mount 接口		M12x0.5-6g
TTL 光学总长		23.01+Liquid Lens
Dimension (ØxL) 外形尺寸		Ø14x22.42mm
Filter Spec 滤光片规格		



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Test setup

Camera:	1/1.8" cropped to 1/2.5", 2250 x 2076 px, Pixel size = 2.4 um
	Model: IDS UI-3881LE-M-GL
Lens:	ELM-5-5.0-7-S with EL-3-10-VIS-26D-FPC embedded
Driver:	Optotune Lens Driver 4i
Target:	USAF chrome target, transparent
Light:	Red backlight

Large field of view with 1/2.5” sensor

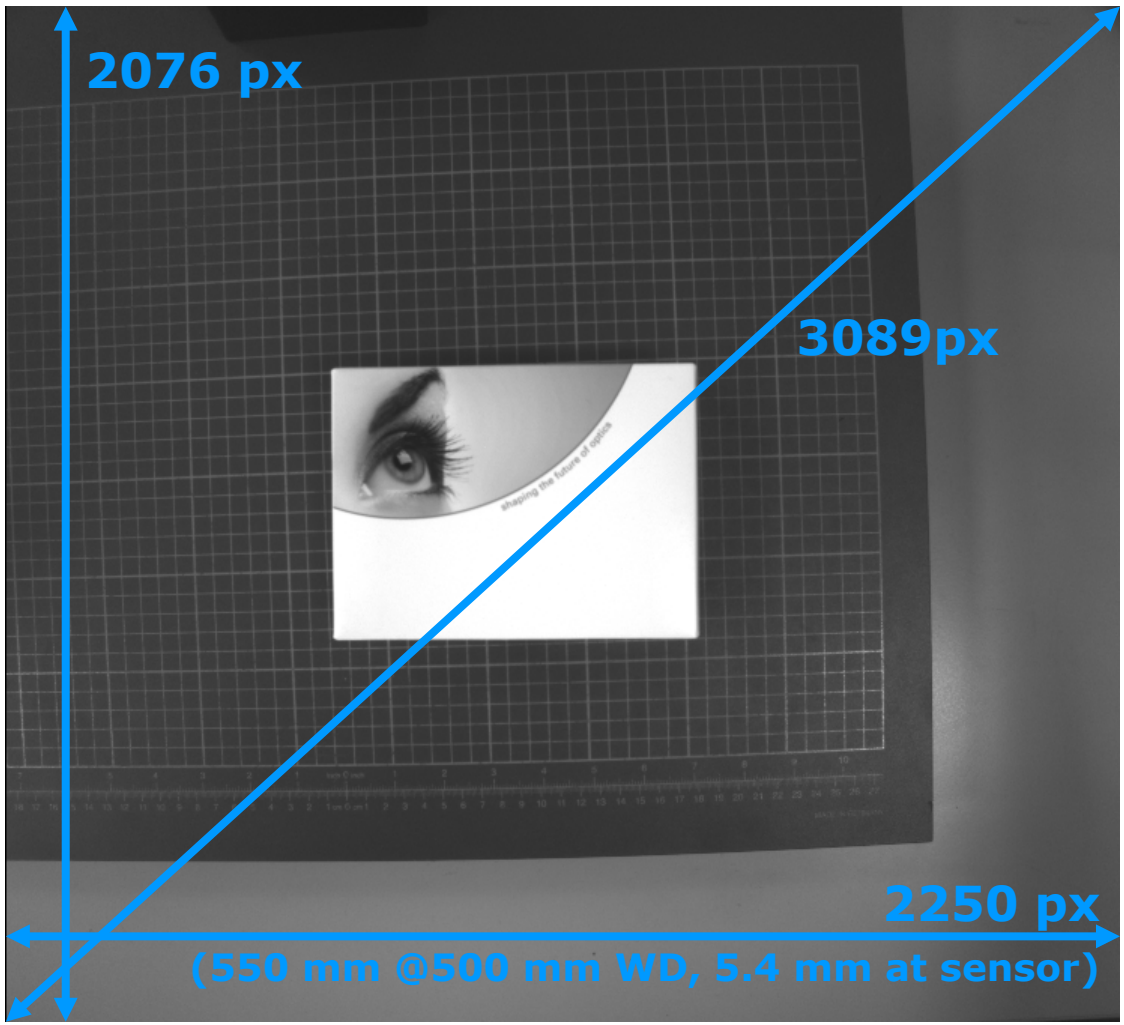
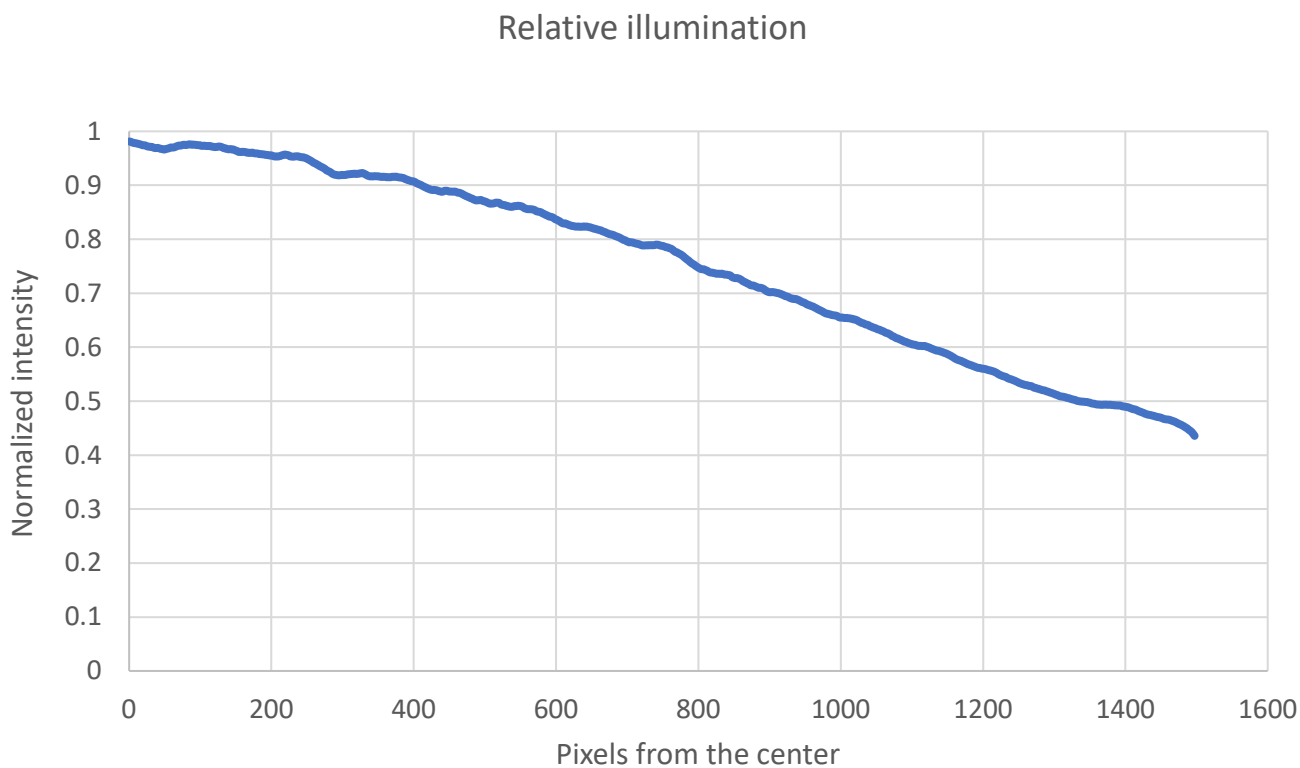


Image size (2.4 um px):

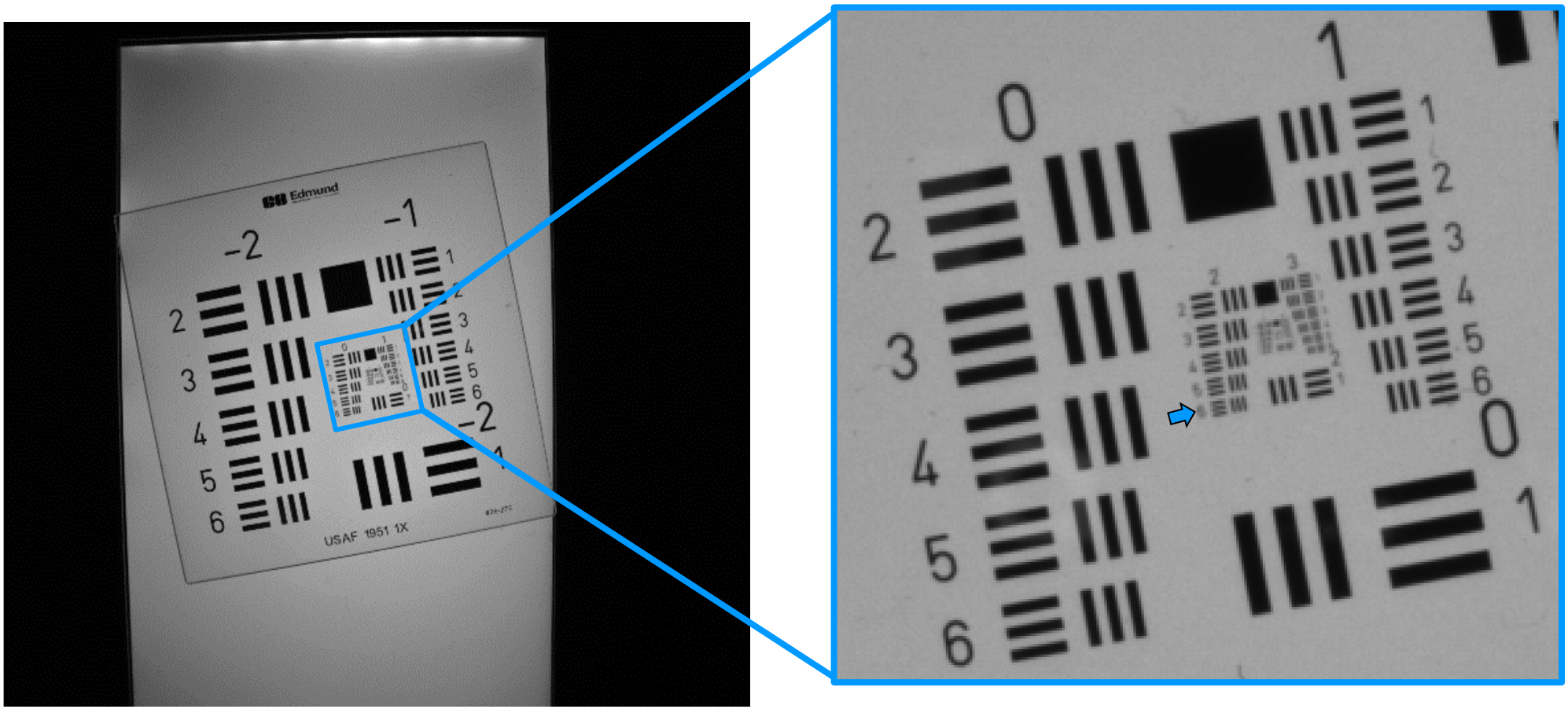
- Width = 5.4 mm
- Height = 5 mm
- Diagonal = 7.4 mm

Relative illumination > 40%



Method for image evaluation

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



WD 500 mm, Nyquist limited in the center

Camera

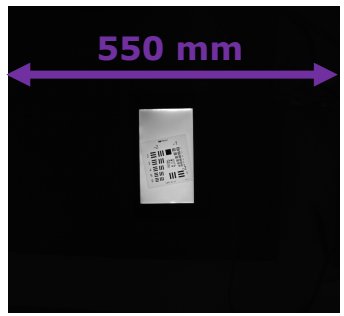
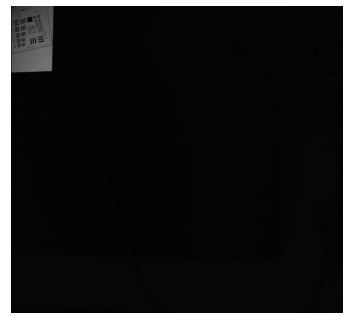
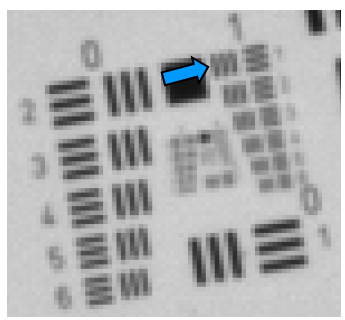
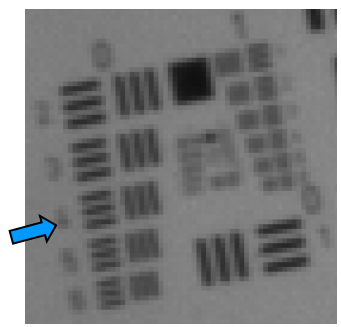
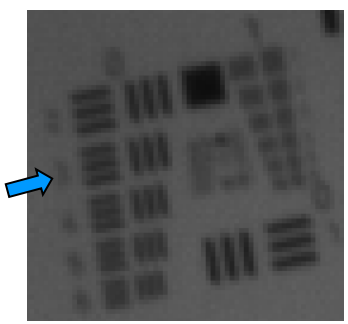
Sensor size = 2250 x 2076 px

Nyquist limit = 208 lp/mm

Pixel size = 2.4 um

Light

Red background illumination

	Center	Edge	Corner
			
	12 mA	2 mA*	2 mA*
			
USAF element:	1/1	0/4	0/3
Line width (um):	250	353.55	396.85
Lp/mm (object):	2	1	1
Magnification:	0.010	0.010	0.010
Lp/mm (image):	**203**	**144**	**128**

*Note: current is adjusted on edges and corner to compensate for field curvature

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WD 130 mm, Nyquist limited in the center

Camera

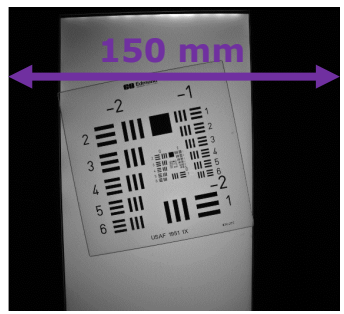
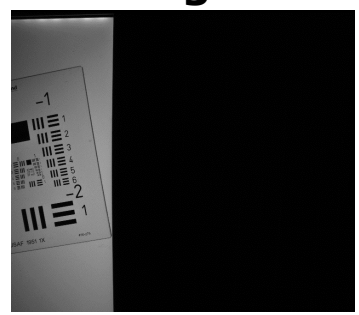
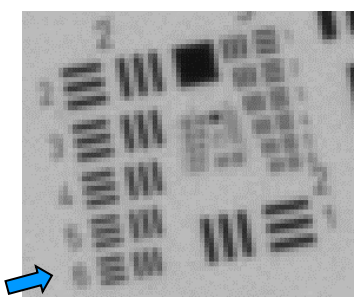
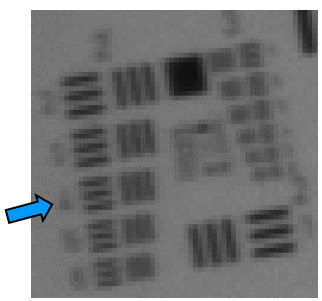
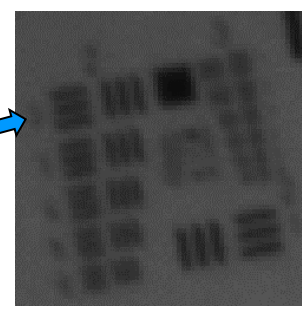
Sensor size = 2250 x 2076 px

Nyquist limit = 208 lp/mm

Pixel size = 2.4 um

Light

Red background illumination

	Center	Edge	Corner
			
	40 mA	**26 mA***	**22 mA***
			
USAF element:	2/6	2/4	2/2
Line width (um):	70.15	88.39	111.36
Lp/mm (object):	7	6	4
Magnification:	0.036	0.036	0.036
Lp/mm (image):	**197**	**157**	**124**

*Note: current is adjusted on edges and corner to compensate for field curvature

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WD 60 mm, Nyquist limited in the center

Camera

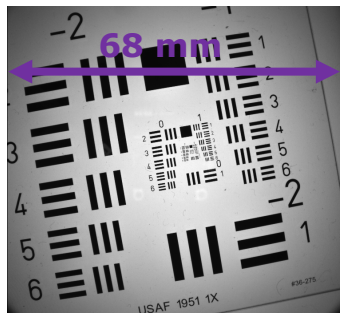
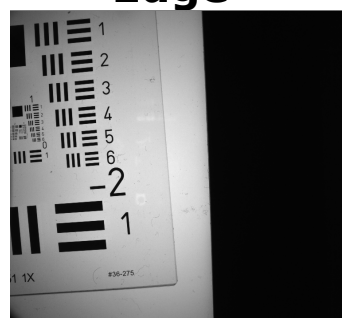
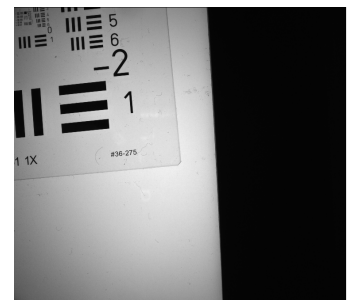
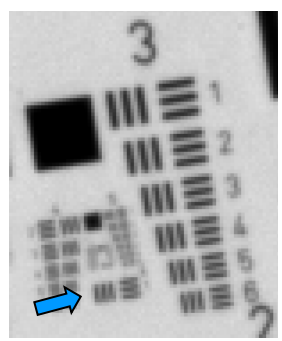
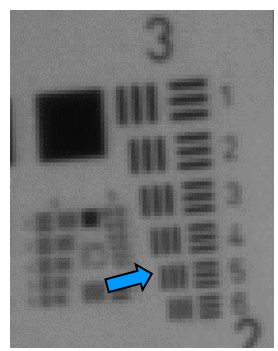
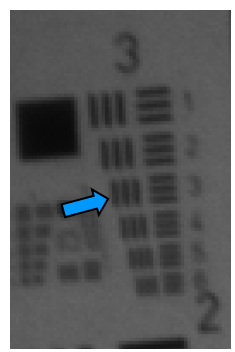
Sensor size = 2250 x 2076 px

Nyquist limit = 208 lp/mm

Pixel size = 2.4 um

Light

Red background illumination

	Center	Edge	Corner
			
	20 mA	**10mA***	**6mA***
			
USAF element:	4/1	3/5	3/3
Line width (um):	31.25	39.37	49.61
Lp/mm (object):	16	13	10
Magnification:	0.080	0.080	0.080
Lp/mm (image):	**201**	**159**	**126**

*Note: current is adjusted on edges and corner to compensate for field curvature. Nominal WD (@0mA) set to 82mm.

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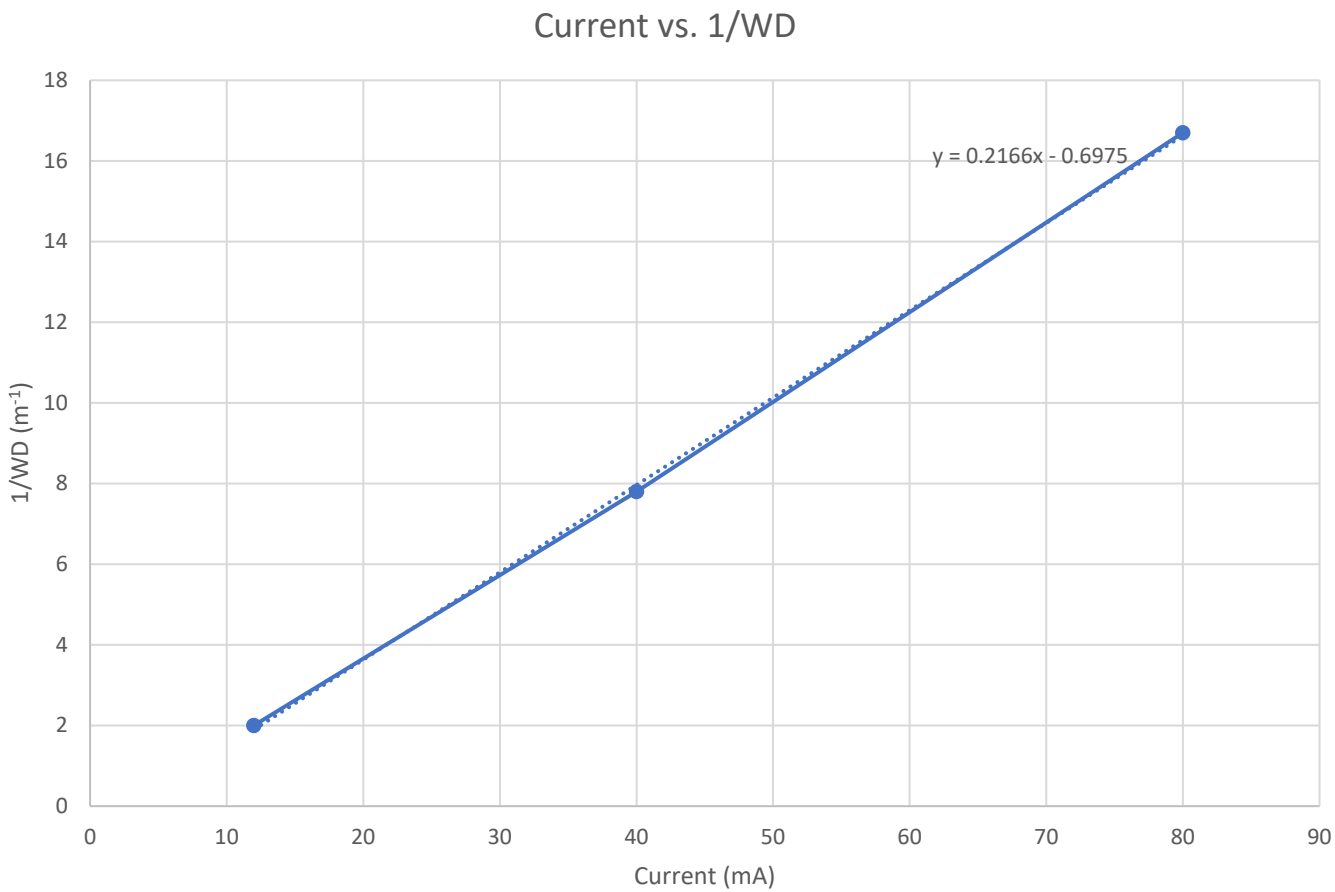
Linear relationship Current vs. 1/WD



- Optical leverage: 6.28 mm/mA (30 mm/dpt) in the 500 to 60 mm range
- Hyperfocal distance ≈ 500 mm

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