# TECHSPEC® LIQUID LENS M12 IMAGING LENSES #37-521 • 6mm • f/2.4

TECHSPEC® Liquid Lens M12 Imaging Lenses feature a high-resolution f/2.4 optical design with an integrated liquid lens, allowing for fast electronic focus, superior image performance, and a quick autofocus solution. When combined with appropriate camera and software, the focus tunable liquid lens provides the active focus control needed to achieve an autofocus solution. The high light throughput f/2.4 aperture is ideal for high-speed machine vision applications.

| | |
|---|---|
| **Focal Length:** | 6mm |
| **Working Distance[1]:** | 100mm - ∞ |
| **Max. Sensor Format:** | 1/2" |
| **Optimized Sensor Format:** | 1/3" |
| **Camera Mount:** | M12 |
| **Aperture (f/#):** | f/2.4 |
| **Distortion %[2]:** | <10% on 1/3" sensor |
| **Object Space NA[3]:** | 0.038527 |

| | |
|---|---|
| **Magnification Range:** | 0X - 0.057X |
| **Type:** | M12 Lens |
| **Length:** | 27.2mm |
| **Weight:** | 14g |
| **RoHS:** | Compliant |
| **Number of Elements (Groups):** | 7 (6) |
| **AR Coating:** | $MgF_2$ (400 - 700nm) |

1. From front housing 2. At 750mm W.D. 3. At Minimum W.D.

| At Minimum W.D. (100mm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sensor Size** | 1/4" | 1/3" | 1/2.5" | 1/2" | 1/1.8" | 2/3" | 1" |
| **Field Of View[4]** | 67.3mm - 34.2° | 92.1mm - 45.6° | 114.3mm - 55.1° | 128.6mm - 60.8° | N/A | N/A | N/A |

4. Horizontal FOV on Standard (4:3) sensor format. Min W.D.

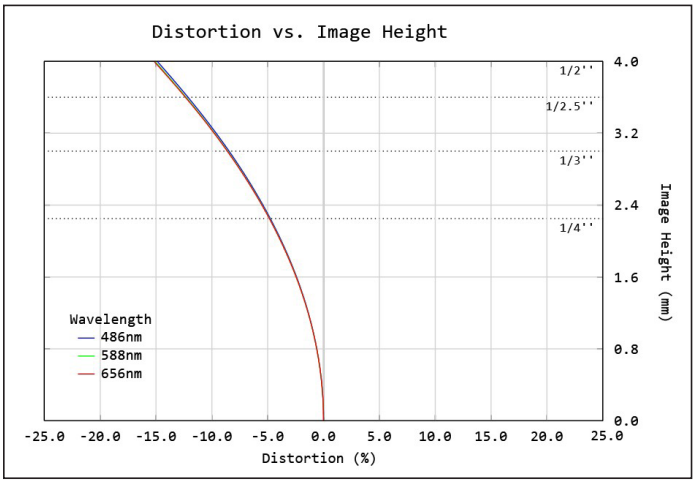


**Figure 1:** Distortion at the maximum sensor format. Positive values correspond to pincushion distortion, negative values correspond to barrel distortion.

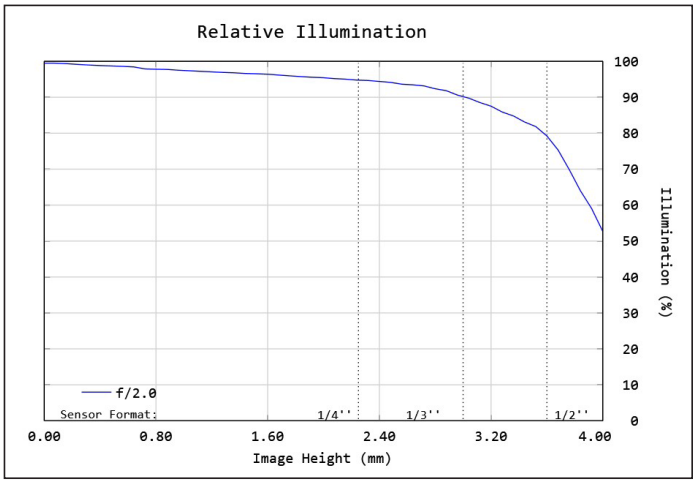


**Figure 2:** Relative illumination (center to corner)

In both plots, field points corresponding to the image circle of common sensor formats are included. Plots represent theoretical values from lens design software. Actual lens performance varies due to manufacturing tolerances.

**MTF & DOF:** f/2.4
**WD:** 250mm
**HORIZONTAL FOV:** 218mm

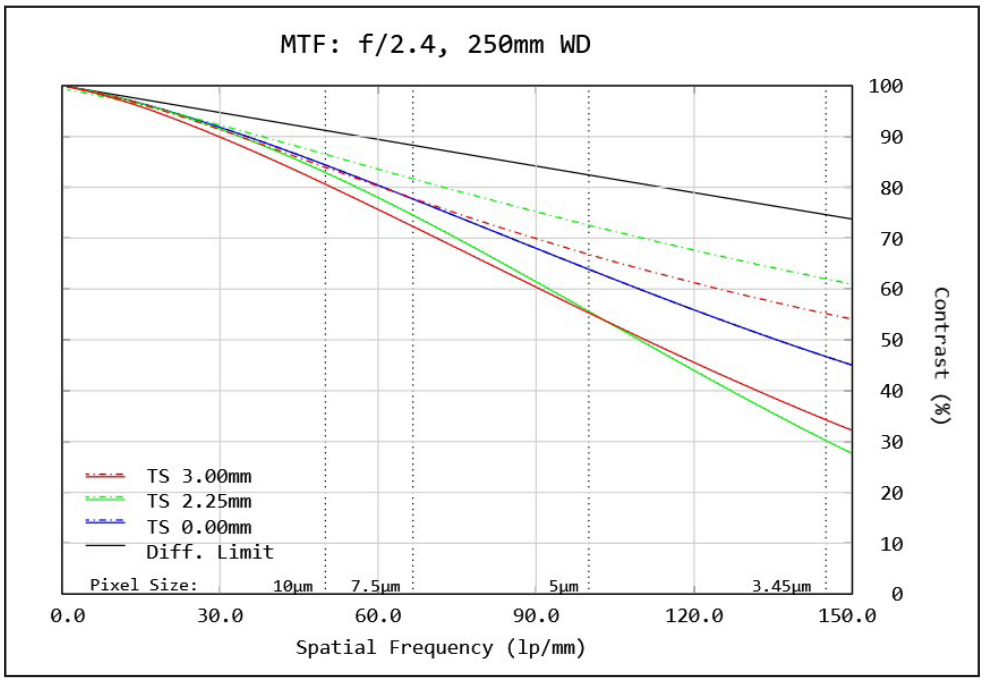


**Figure 3:** Image space polychromatic diffraction FFT Modulation Transfer Function (MTF) for λ = 486nm to 656nm. Included are the Tangential and Sagittal values for field points on center, at 70% of optimal field height and the optimized sensor format. Solid black line indicates diffraction limit determined by f/#-defined aperture. Frequencies corresponding to the Nyquist resolution limit of pixel sizes are indicated.

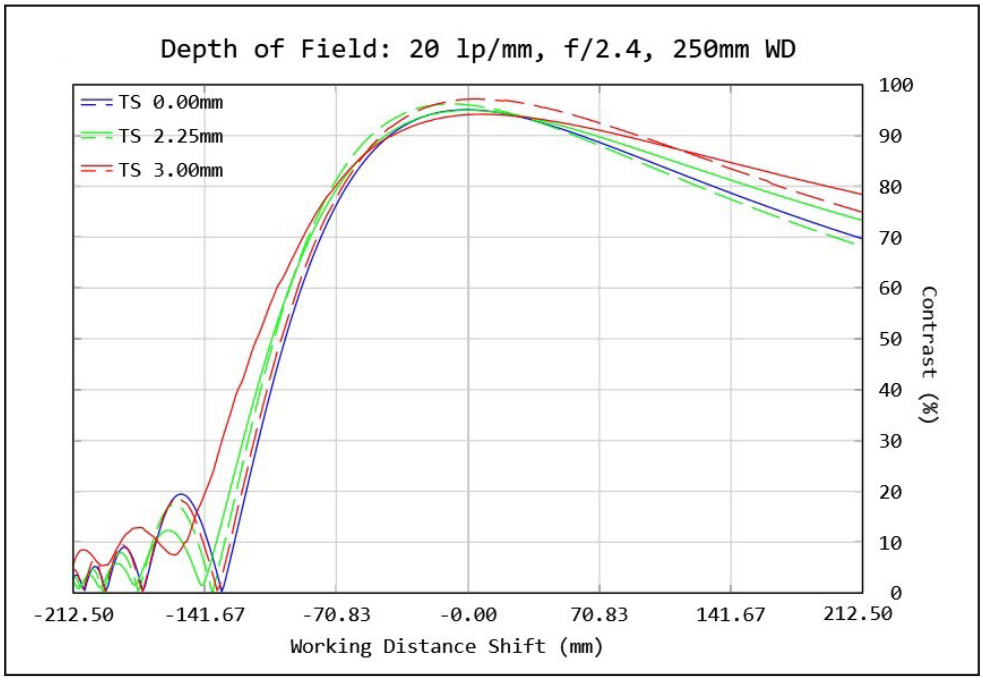


**Figure 4:** Polychromatic diffraction through-focus MTF at 20 linepairs/mm (image space). Contrast is plotted to two times the focus distance. Note object spatial frequency changes with working distance.

Plots represent theoretical values from lens design software. Actual lens performance varies due to manufacturing tolerances.

**MTF & DOF:** f/2.4
**WD:** 583mm
**HORIZONTAL FOV:** 500mm

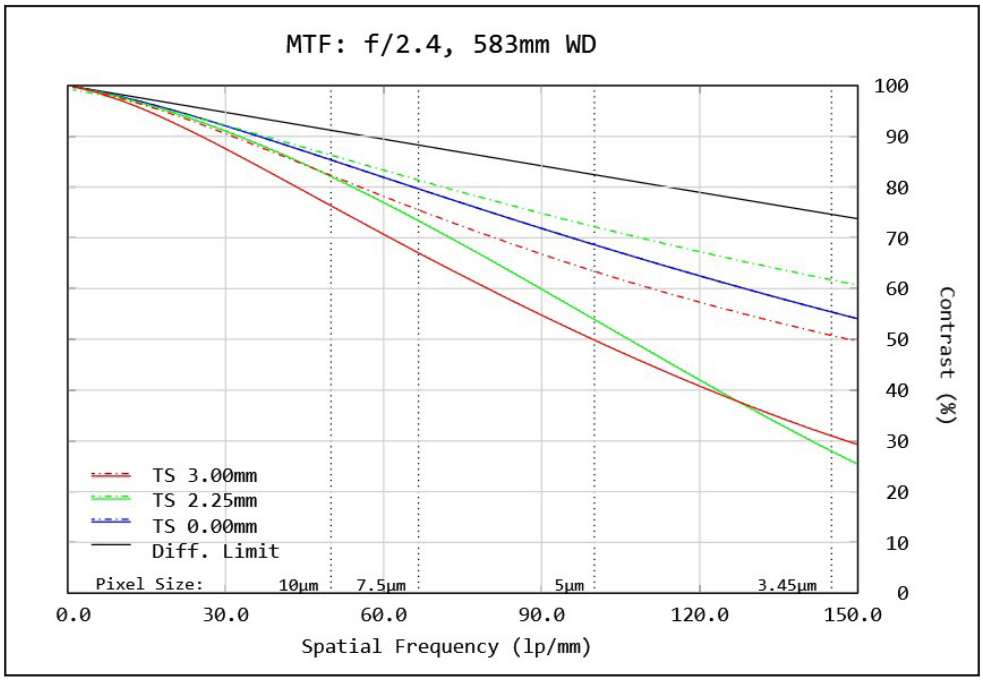


**Figure 5:**: Image space polychromatic diffraction FFT Modulation Transfer Function (MTF) for λ = 486nm to 656nm. Included are the Tangential and Sagittal values for field points on center, at 70% of optimal field height and the optimized sensor format. Solid black line indicates diffraction limit determined by f/#-defined aperture. Frequencies corresponding to the Nyquist resolution limit of pixel sizes are indicated.

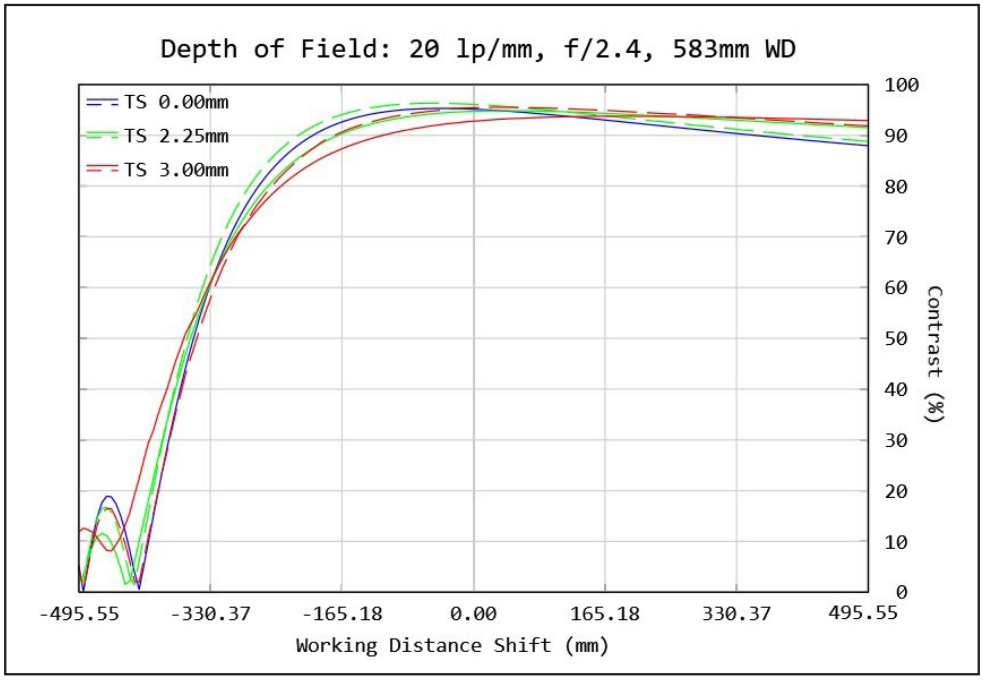


**Figure 6:** Polychromatic diffraction through-focus MTF at 20 linepairs/mm (image space). Contrast is plotted to two times the focus distance. Note object spatial frequency changes with working distance.

Plots represent theoretical values from lens design software. Actual lens performance varies due to manufacturing tolerances.

**MTF & DOF:** f/2.4
**WD:** 750mm
**HORIZONTAL FOV:** 683mm

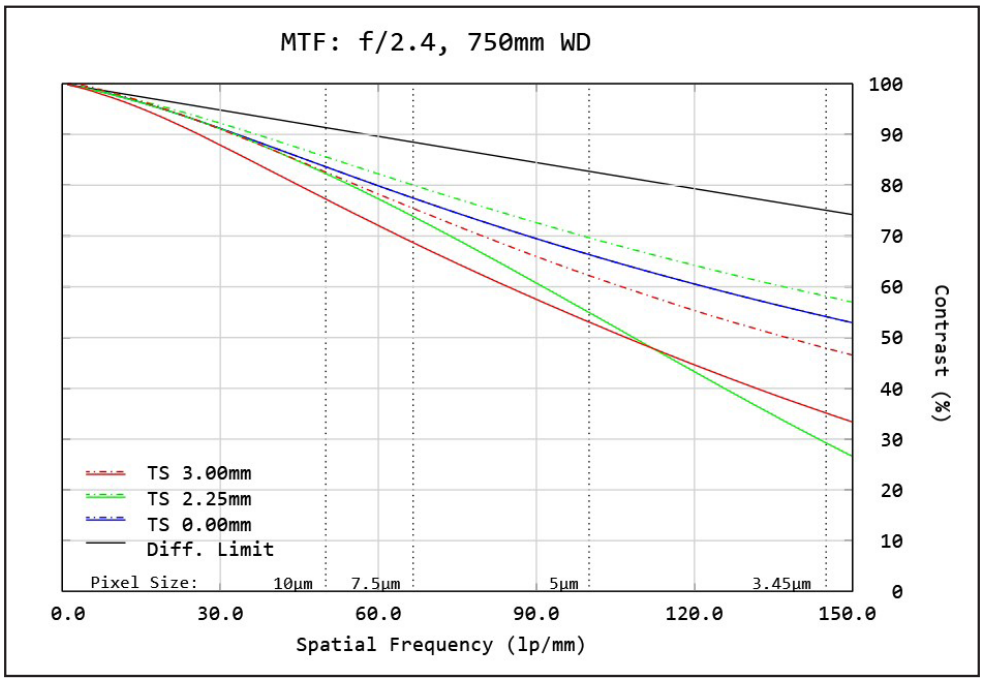


**Figure 7:** Image space polychromatic diffraction FFT Modulation Transfer Function (MTF) for $\lambda$ = 486nm to 656nm. Included are the Tangential and Sagittal values for field points on center, at 70% of optimal field height and the optimized sensor format. Solid black line indicates diffraction limit determined by f/#-defined aperture. Frequencies corresponding to the Nyquist resolution limit of pixel sizes are indicated.

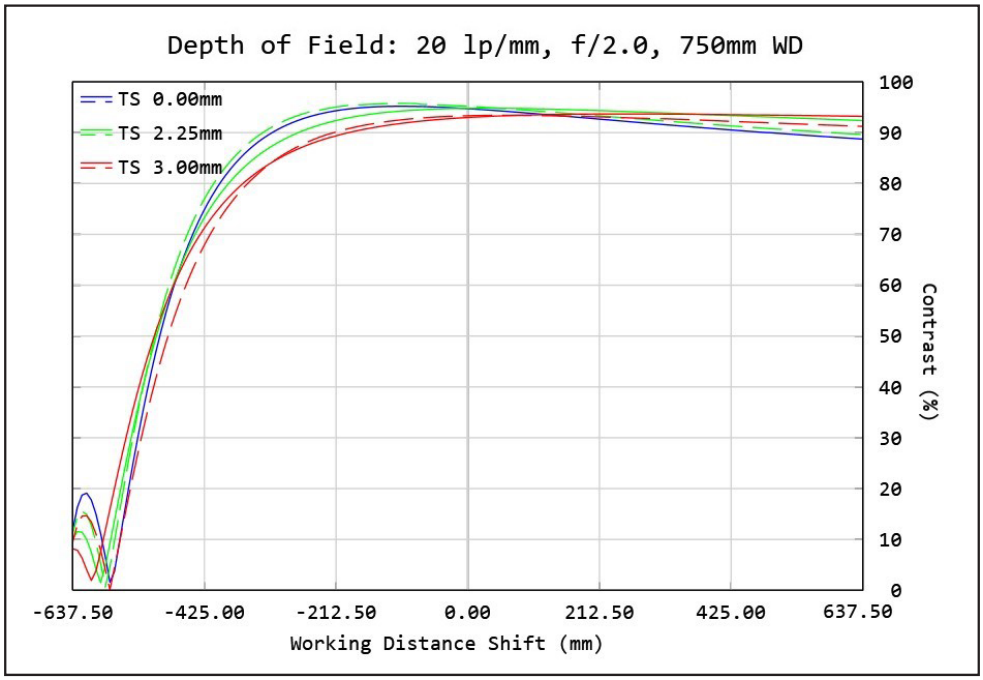


**Figure 8:** Polychromatic diffraction through-focus MTF at 20 linepairs/mm (image space). Contrast is plotted to two times the focus distance. Note object spatial frequency changes with working distance.

Plots represent theoretical values from lens design software. Actual lens performance varies due to manufacturing tolerances.