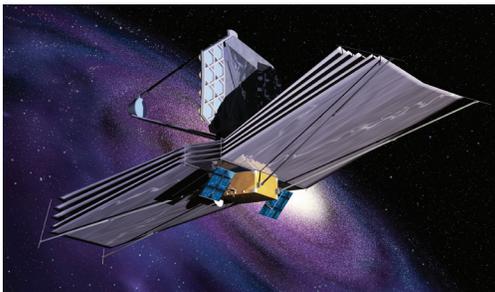


Close-up of 4 State Pixelated Polarizer

Applications

- Imaging Polarimetry
- Polarization Difference Imaging
- 3D
 - Image Capture
 - Display
 - Biometric facial recognition
- Biological Analysis
 - Cell differentiation
- Polarization Microscopy
- Polarized Fiberoptic Probes
- Remote Sensing
- Target discrimination
- Interferometry



Courtesy ESA. To meet the extreme polishing and surface requirements of the James Webb Telescope, a new interferometer was developed with advanced, state-of-the-art defining capabilities using Moxtek's pixelated polarizer technology.

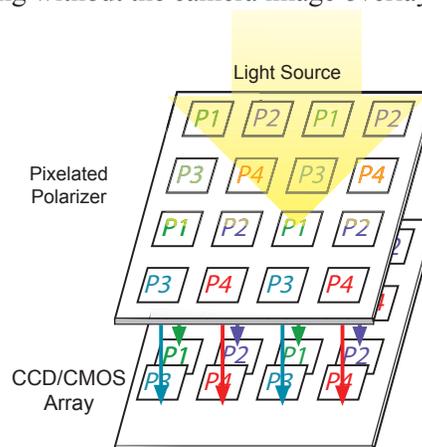


Pixelated polarizers are designed using Moxtek® Nanowire® Technology. Pixelated polarizers are available as two, three and four-state devices for polarimetric imaging. Polarization helps to pull more information from an obscured image to enable clearer imaging. With Pixelated Polarizers, multiple polarizations across the visible and into IR wavelengths can be gathered real-time. This enables 3D imaging technology and extreme low light imaging. Using 8 inch wafer technology Moxtek is able to manufacture these devices in high-volume. Pixel pitch can be customized for different CCD/CMOS sensor arrays.

Features	Benefits
Nanowire Technology	Brightness and contrast uniformity
	>20° half angle without performance loss
	Wavelength and AOI independent
Inorganic	UV and IR wavelengths
	High reliability
	High heat resistant
	Two, three or four-state devices
Pixelation	Compatible with high-resolution sensor arrays
	User defined geometries
	Low cross-talk
	Accurate registration
	Allow for single camera systems

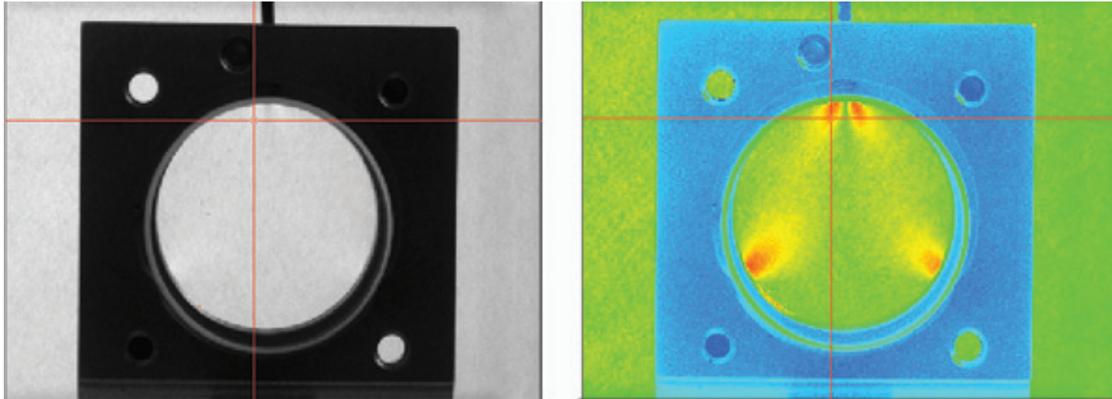
Direct Pixel-to-Pixel Overlay

3D Imaging- The traditional way to 3D image is to use two shots with different polarizations and two cameras precisely aligned to each other. Then the imaging information must be very carefully overlaid and aligned. The advantage with pixelated polarization on a CCD/CMOS array is that you achieve the equivalent information in a single shot that otherwise would require at least two polarizations with two cameras. Pixelated polarization enables real-time 3D imaging without the camera image overlay difficulty.



Example of Target Discrimination

Low Light Imaging- Pixelated polarizers are ideal for low light conditions. Light is used to create contrast. In low light, the image or object cannot be distinguished from background 'noise'. Color cannot be seen, and the image or object cannot be seen unless something moves causing a change which can be seen. Multiple polarizations at a single moment overcome the lack of color, contrast, and the lack of reference movement enabling the object to be imaged with remarkable clarity and contrast.



4D Technology's PolarCam micropolarizer cameras simultaneously capture multiple polarized images of each video frame, enabling a range of image enhancement techniques and polarimetric measurements. Optional PolarView software (shown) provides real-time display and calculation of key polarization parameters.

Typical Optical Performance

Transmission: >80% @ 550nm

Contrast Ratio: >200:1 @ 633nm

Bandwidth: 300nm to 3 μ m

Substrate Thickness: 0.7mm std.

Substrate Materials: Glass, other options

RoHS: Compliant

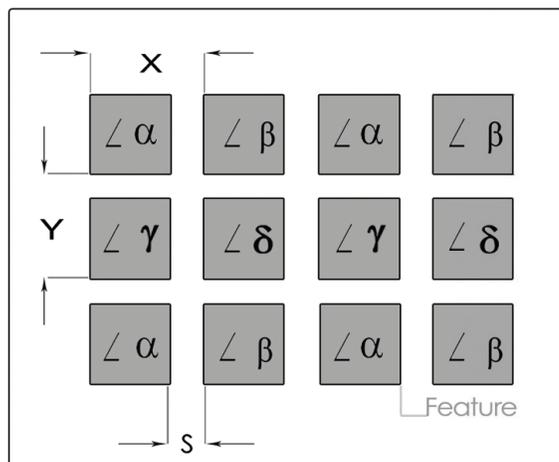
Production: Developmental Product- Limited Availability

Standard Dimensional Specifications

Pixel Pitch (X, Y): 9.0 μ m, 7.4 μ m standard, custom pitches available

Feature Spacing (S): $\geq 1\mu$ m

Maximum Number of Polarization Axes: 4 ($\angle \alpha$, $\angle \beta$, $\angle \gamma$, $\angle \delta$), line scan row arrangement available also



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The U.S. Department of State has determined that Pixelated Polarizers which operate in the visible spectrum are not ITAR-controlled (See CJ 304-12).

OPT-DATA-1005, Rev D
Subject to technical change without notice