

# HASO4

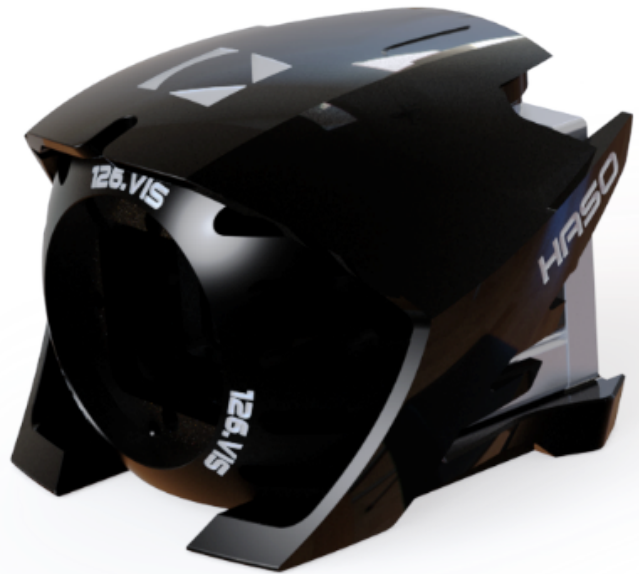
## 126 VIS

**HIGH ACCURACY**  
WAVEFRONT SENSOR

**HIGH RESOLUTION**  
21420 MICROLENSSES

**COMPACT**  
ROBUST AND VERSATILE

**EASY TO USE**  
AND INTEGRATE



**Shack-Hartmann wavefront sensor  
for highly demanding applications**

## A UNIQUE SET OF ADVANTAGES

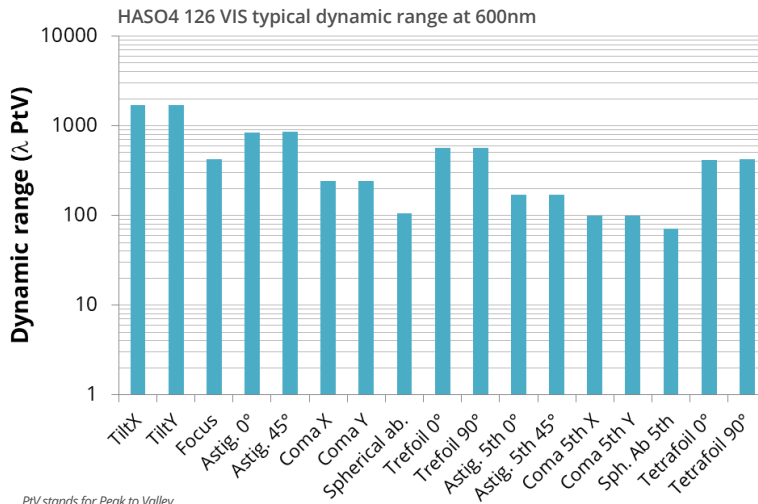
- Wavefront sensor on the latest CMOS camera for the 350-1100 nm range<sup>(1)</sup>
- 170 x 126 sampling points over a 13.77 mm x 10.22 mm sensing area
- $\lambda/100$  rms absolute accuracy or  $\geq 6$  nm RMS<sup>(1)</sup>
- 30 Hz acquisition frequency<sup>(2)</sup>
- External trigger capability
- Spot Tracker eliminates alignment requirements
- Patented technology for simultaneous and independent measurements of phase and intensity
- USB 3.0 connectivity
- Compatible with WaveKit (SDK) in C/C++, LabVIEW and Python
- Compatible with R-Flex2 for optics alignment and characterization

<sup>(1)</sup>  $\lambda/100$  rms or 6 nm rms absolute accuracy is ensured in this range for incoherent sources. For coherent sources lower than 400nm or higher than 750nm, the accuracy is reduced to 20nm RMS

<sup>(2)</sup> 30Hz in sequence mode, 10Hz for wavefront display

Providing outstanding performance, the HASO wavefront sensor family is used worldwide in the most demanding applications in optical metrology, industrial control, microscopy and laser diagnostics. We offer a unique combination of expertise in high-quality microlens production, software development and accurate factory calibrations. This allows the HASO4 126 VIS to provide high performance for applications requiring a high spatial frequency and very large dynamic range.

- Acceptable tilts up to +/-3°, and NA up to 0.1
- Large dynamic range (see the graph below)
- Independent phase (wavefront) and intensity (amplitude) measurements
- Easy hardware and software integration



### EXAMPLES OF APPLICATIONS

- Optical metrology such as for freeform optics, parabolic mirrors, etc.
- Product quality control
- High spatial-frequency aberration detection

### SOFTWARE

- **WaveView** is the most advanced wavefront measurement and analysis software. It offers more than 150 features and tools optimized for a wide range of highly demanding applications. WaveView development philosophy is based on tens of years of customer feedback, improving the user experience with each version. WaveView provides a function to analyze segmented wavefronts and allows autosave for sequence measurements. Modules dedicated to PSF and MTF are available.
- **WaveKit** is the SDK in C/C++, LabVIEW and Python, providing the basic blocks on which one can build a fully customized software for specific HASO-based applications or WaveView data processing routines. WaveKit is available on request.

### SPECIFICATIONS

Aperture dimension	13.77 x 10.22 mm <sup>2</sup>
Number of microlenses	170 x 126
Tilt dynamic range	± 3 °
Focus dynamic range	± 0.010 m to ± ∞
Absolute accuracy (incoherent source)	λ/100 or 6 nm rms in 350-1100 nm
Absolute accuracy (coherent source)	λ/100 or 6 nm rms in 400-750 nm 20nm rms for <400 nm and >750 nm
Sensitivity	<λ/200 rms
Spatial sampling	~ 81 μm
Maximum acquisition frequency	30 Hz
External trigger	TTL signal
Working wavelength range	350 - 1100 nm*
Dimensions / weight	47 x 60 x 62 mm <sup>3</sup> / 200g
Working temperature	15 - 30 °C
Interface / Power consumption	USB 3.0 / 3.6W
Operating system	Windows 10
Minimum power	0.7 nW**

\* See Absolute accuracy

\*\* At 30 Hz, the maximum exposure duration is 33ms.