

HASO R.FLEX2

FROM 400 TO 1100 nm
WITH $\lambda/200$ RMS ACCURACY

COMPACT AND ROBUST
FOR EASY INTEGRATION

UP TO 21000
SAMPLING POINTS

UP TO 1 kHz
ACQUISITION FREQUENCY



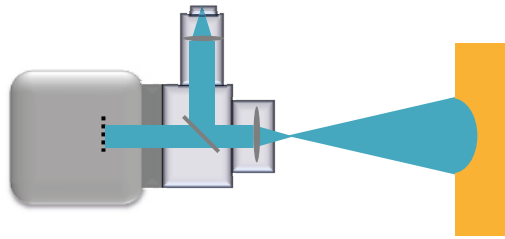
Wavefront and MTF measurements for characterizing optical components, such as lenses, filters, waveplates, telescopes and complex optical systems

A UNIQUE SET OF ADVANTAGES

- $\lambda/200$ rms measurement accuracy in double-pass configuration
- Patented technology, which allows simultaneous and independent measurement of phase and intensity
- Insensitive to vibrations and atmospheric turbulences
- Platform compatible with fibered light sources in 400-1100 nm wavelength range
- Delivered with WaveView metrology software
- Collimated or diverging exit beam with several standard focusing modules from F/0.87
- Removable wavefront sensor for using it as a stand-alone unit
- Highly accurate wavefront analysis even with central obscuration and spider-beam types
- Several accessories available, such as laser diode light sources, reference mirrors for calibration, translation stages, etc
- Latest generation of HASO Shack-Hartmann wavefront sensors included

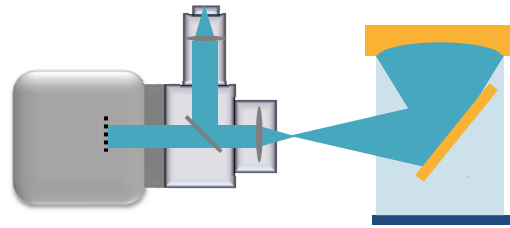
Measuring large concave mirrors

HASO R-Flex has been optimized using proprietary designs that enable manufacturers to accurately measure large uncoated concave mirrors by positioning the unit to measure at the center of curvature.



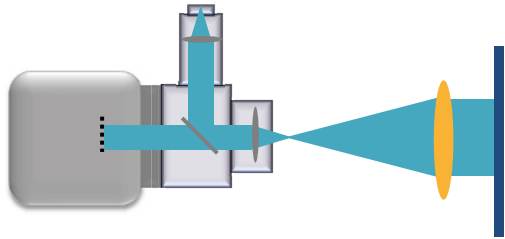
Characterizing complex optical systems

Complex optical systems such as telescopes and collimators can be readily characterized by HASO R-Flex. The best focal point can be found using wavefront error whereas, if the focus point is defined mechanically, optics can be aligned for that point.



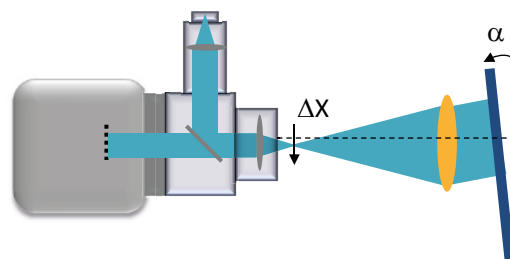
Measuring lenses on-axis

Any diameter lenses are easily measured with HASO R-Flex by using a coated or uncoated flat reference mirror to reflect the beam back to the wavefront sensor without adding any aberrations.



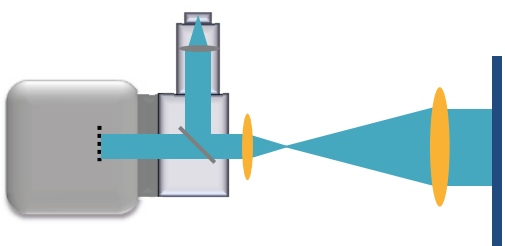
Characterizing lenses in the field

By mounting the HASO R-Flex onto a translation stage and orienting the flat reference mirror correspondingly, you can qualify lenses at any point in the field.



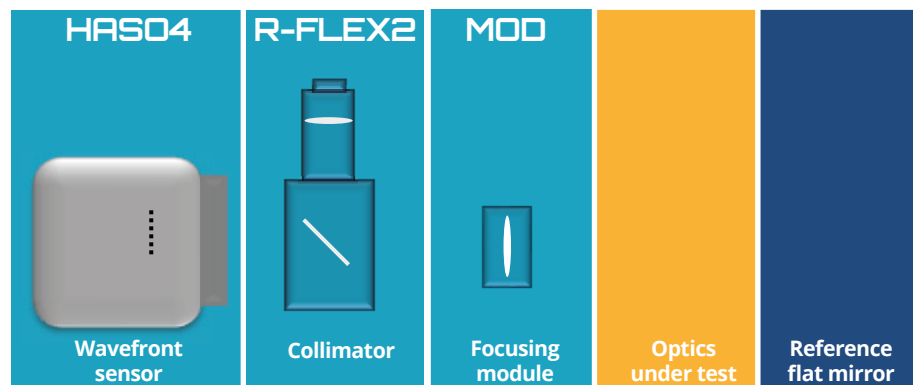
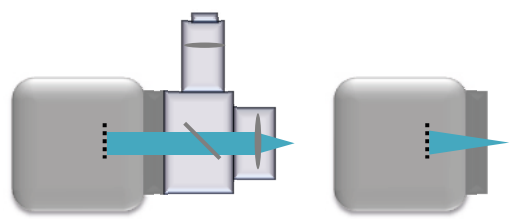
Characterizing & aligning beam expanders

HASO R-Flex's modularity is particularly useful since its focusing unit dismounts quickly and therefore a collimated beam can be used as an illumination source to characterize the beam expander without adding any aberrations.



Working with external sources

High N/A external sources can be accurately measured because the optical head can be completely characterized (left image). Dismount it, and you can use the wavefront sensor as a stand-alone unit (right image).



FOCUSING MODULES

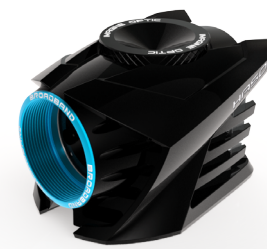
Compatibility with HASO wavefront sensors and F/#

	HASO XX Coming soon	HASO4 BBROADBAND	HASO4 FIRST	HASO4 FAST
Number of microlenses	Up to 21420 (126x170)	Up to 3400 (50 x 68)	Up to 1280 (32 x 40)	Up to 256 (16 x 16)
Maximum acquisition frequency (Hz)	30	20	99	1000
Module name	F number			
MOD F20	-	3.8	5.6	16.8
MOD F31	3.0	6.0	8.6	26.1
MOD F40	3.9	7.7	11.1	33.6
MOD F50	4.9	9.6	13.9	42.0
MOD F60	5.8	11.5	16.7	50.4
MOD F75	7.3	14.4	29.8	63.0
MOD F4.5 AFOx1 + MOD50-1	-	0.87	1.25	3.78
MOD F9 AFOx1 + MOD50-2	-	1.73	2.5	7.56
MOD F9 HR AFOx0.5 + MOD50-1	0.87	-	-	-
MOD F18 HR AFOx0.5 + MOD50-2	1.73	-	-	-

Focusing module specifications

	Focal length (mm)	Required power back (%)
MOD F20	20	4
MOD F31	31	4
MOD F40	40	4
MOD F50	50	4
MOD F60	60	4
MOD F75	75	4
AFO x 0.5	∞	-
AFO x 1	∞	-
MOD F4.5 AFOx1 + MOD50-1	4.5	80
MOD F9 AFOx1 + MOD50-2	9	80
MOD F9 HR AFOx0.5 + MOD50-1	9	80
MOD F18 HR AFOx0.5 + MOD50-2	18	80

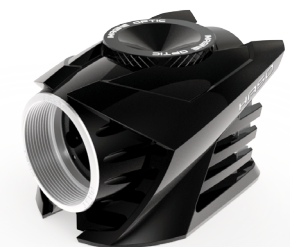
All focusing modules have pupil imaging. In other words, the microlens array of the wavefront sensor is imaged at infinity by the focusing module.



HASO4 BROADBAND



HASO4 FIRST



HASO4 FAST

Accessories

Translation stage

Our $\Theta X \Theta Y$ rotation stage for angular alignment or the 5-axis stage that provides 2-way rotation around X and Y axes as well as 3-way translation along X, Y and Z axes is a perfect complement to the HASO R-Flex system.

Software add-on

HASO R-Flex is delivered with WaveView software, which is a leading wavefront metrology software providing 180 independent features. We also offer optional software modules including MTF (Modulation Transfer Function) and PSF (Point Spread Function) that increase the functionality of HASO R-Flex system.

Reference mirror

To complete your metrology system, we provide a spherical reference mirror ($\varnothing 20\text{mm}$ useful pupil, $R=15\text{mm}$, $F/0.75$) for the calibration of HASO R-Flex in double-pass measurement configuration.

Single-Mode Laser Source (SMLS)

For those who want to use their HASO R-Flex at different wavelengths, we provide additional single-mode diode lasers to further expand the versatility of the system.

Available SMLS wavelengths:

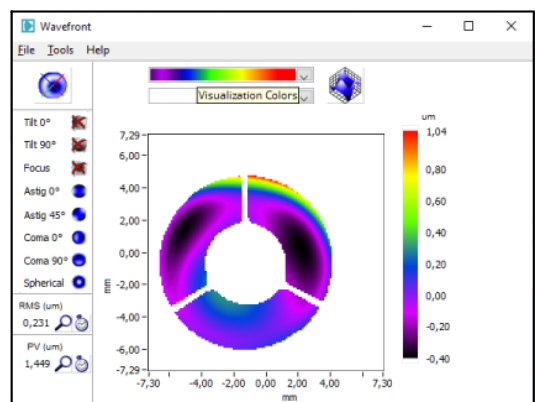
Model name	Wavelength (nm)	Maximal power (mW)
SMLS 405-S	405	4.5
SMLS-488-S	488	4.5
SMLS 520-S	520	4.5
SMLS 635-S	635	4.5
SMLS 785-S	785	4.5
SMLS 830-S	830	4.5
SMLS 1064-S	1064	4.5
SMLS 1550-S	1550	4.5
SMLS custm	Ask	Ask



SMLS



HASO R-FLEX2 with MOD F31 focusing module



Screenshot of WaveView software showing a wavefront map of a spider-type beam