

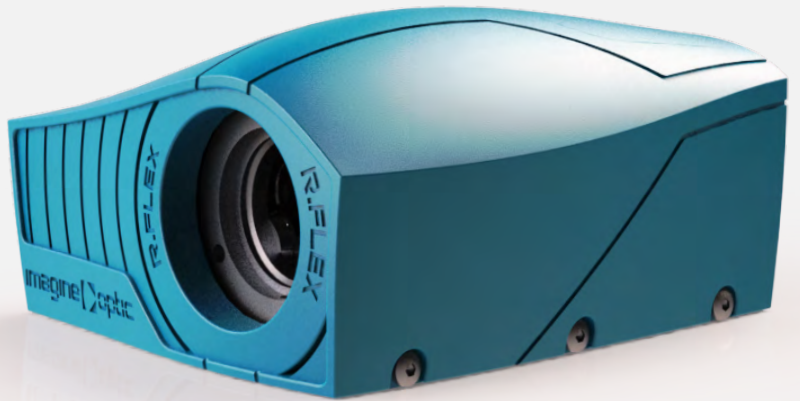
HASO R.FLEX

METROLOGY TOOL
FOR LARGE SIZE OPTICS

COMPACT AND LIGHT
FOR EASY MANIPULATION

LARGE DYNAMIC RANGE
AND HIGH ACCURACY

TWO MODELS AVAILABLE
FOR VIS AND NIR SPECTRAL RANGES



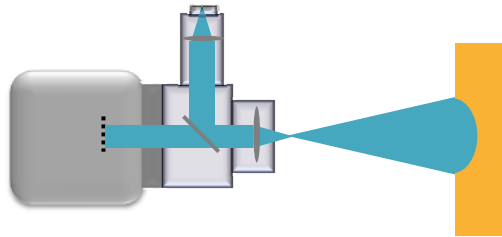
Cost-effective metrology tool for characterization of optical components, such as large concave mirrors and complex optical systems

A UNIQUE SET OF ADVANTAGES

- Standard accuracy of $\lambda/100$ rms and $\lambda/200$ rms in double-pass configurations
- Patented technology, which allows simultaneous and independent measurement of phase and intensity
- Insensitive to vibrations and atmospheric turbulences
- Delivered with WaveView metrology software
- Collimated or diverging exit beam with different focusing modules from F/1 to F/15
- User can chose the inspection wavelength from 400-700nm and 650-1100nm spectral ranges
- Removable wavefront sensor for using it as a stand-alone unit
- Available numerous accessories, such as laser diodes, reference mirrors for calibration, translation stages, etc

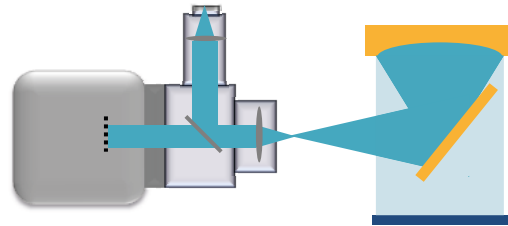
Measuring large concave mirrors

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.



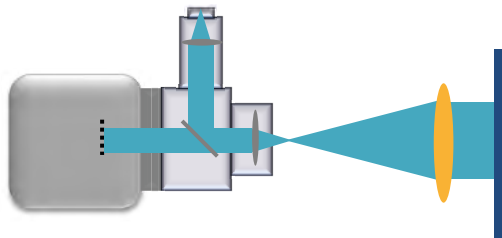
Characterizing complex optical systems

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.



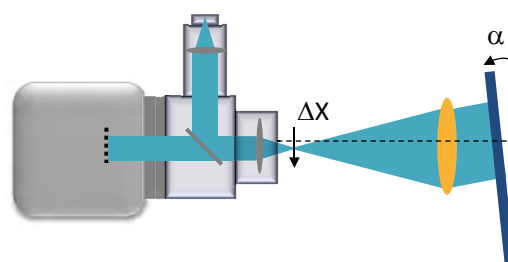
Measuring lenses on-axis

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.



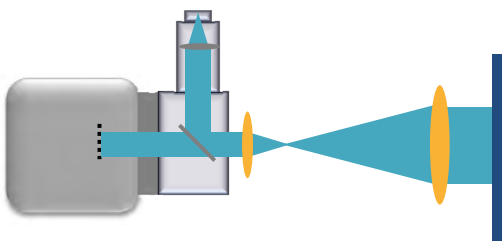
Characterizing lenses in the field

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.



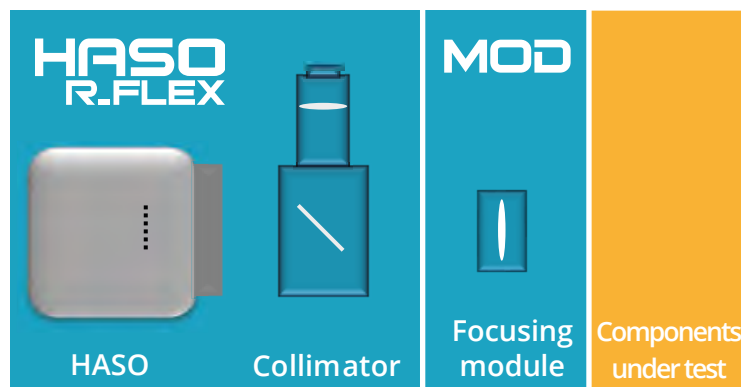
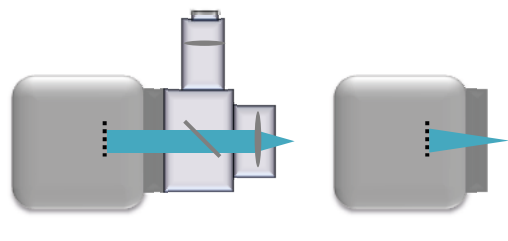
Characterizing & aligning beam expanders

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).



HASO4 R-Flex 50 VIS

for 400-700nm spectral range, by default delivered with SMLS at 635nm (other wavelengths available)

HASO4 R-Flex 50 VIS	Pupil size (mm ²)	Sensitivity rms (nm) ¹	Relative Accuracy rms (nm) ¹	Sampling points	Weight (kg)	Size WxHxD(mm ³)
	5.2 x 7.0	3	4	50 x 68	0.5	110 x 60 x 122
Focusing Modules	Focal length (mm) ²	F-number	WFE rms (nm) ³	Working distance (mm) ⁴	Pupil imaging ⁵	Required power back (%)
MOD50-1 VIS	4.5	1	60	0.6	NO*	80
MOD50-2 VIS	9	2	30	1.2	NO*	80
MOD50-4 VIS	19	3.6	150	-2.5	YES	4
MOD50-6 VIS	31	6	80	5.5	YES	4
MOD50-12 VIS	60.4	11.6	60	54.5	YES	4
MOD50-15 VIS	75.2	14.5	50	73.1	YES	4
*AFO-x1 VIS	allows pupil imaging on MOD50-1 VIS and MOD50-2 VIS					

HASO4 R-Flex 50 NIR

for 650-1100nm^{*} spectral range, by default delivered with SMLS at 785nm (other wavelengths available)

HASO4 R-Flex 50 NIR	Pupil size (mm ²)	Sensitivity rms (nm) ¹	Relative Accuracy rms (nm) ¹	Sampling points	Weight (kg)	Size WxHxD (mm ³)
	5.2 x 7.0	3	4	50 x 68	0.5	110 x 60 x 122
Focusing Modules	Focal length (mm) ²	F-number	WFE rms (nm) ³	Working distance (mm) ⁴	Pupil imaging ⁵	Required power back (%)
MOD50-4 NIR	19	3.6	150	-2.5	YES	4
MOD50-6 NIR	30	6	80	5.8	YES	4
MOD50-12 NIR	60.1	11.6	60	55.8	YES	4
MOD50-15 NIR	75.1	14.4	50	72.1	YES	4

* For wavelengths above 950nm, accuracy is ensured for light source with coherence length smaller than 3 mm.

HASO3 R-Flex 128

for 635nm wavelength, delivered with the according SMLS light source

HASO3 R-Flex 128	Pupil size (mm ²)	Sensitivity rms (nm) ¹	Relative Accuracy rms (nm) ¹	Sampling points	Weight (kg)	Size WxHxD(mm ³)
	14.6 x 14.6	3	4	128 x 128	1.6	80 x 194 x 270
Focusing Modules	Focal length (mm) ²	F-number	WFE rms (nm) ³	Working distance (mm) ⁴	Pupil imaging ⁵	Required power back, %
MOD128-1 ⁶	4.5	1	180	0.6	YES	80
MOD128-2 ⁶	9	2	160	1.2	YES	80
MOD128-5.1	75	5.1	150	33	YES	4
MOD128-7.9	115	7.9	100	54	YES	4
MOD128-10	146	10	80	90	YES	4

(1) should be divided by 2 if the optical system is characterized using double-pass method

(2) focal length of the module

(3) WFE is the wavefront error at the output of the module for the largest included round pupil.

(4) distance between the focalization point and the first optics (alignment holes must be removed)

(5) YES means that the microlenses are imaged at infinity by the module.

(6) These modules consist of the association of a x3 beam expander and MOD50-1 or MOD50-2.

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, $R=15\text{mm}$, $NA \sim 0.73$) 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 wavelengths:

Model name	Wavelength (nm)	Maximal power (mW)
SMLS 405-S	405	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



HASO4 R-Flex 50 VIS and NIR

Compact metrology tool designed for VIS and NIR spectral ranges.



Dimensions (mm³): 110 x 60 x 122

HASO3 R-Flex 128

Large pupil with 128x128 sampling points.



Dimensions (mm³): 80 x 194 x 270

www.imagine-optic.com