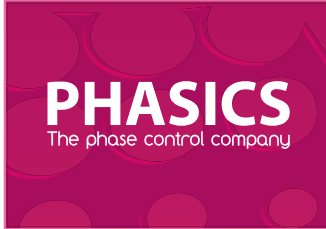
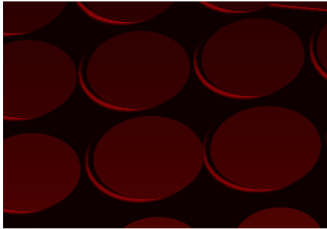
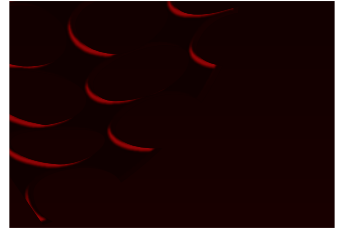
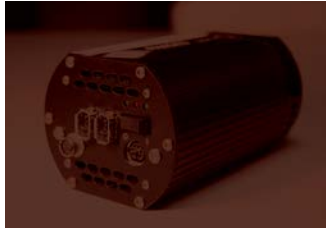
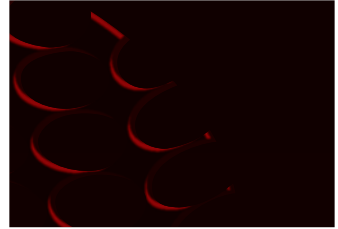
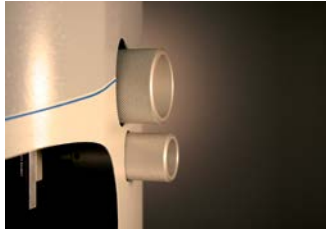


# Kaleo T



# Kaleo T



→ PHASICS offers the most innovative solutions **for lens and objectives quality control in R&D and production**. Relying on a unique wavefront technology, the quadriwave lateral shearing interferometry\*, PHASICS solutions provide a **fast and complete characterization** of your optics.

## MEASURED ELEMENTS

- Lens
- Objective, Zoom
- Strongly aberrated subassembly

## APPLICATIONS

- New product development
- Process optimization
- Cost-effective alignment of objectives

## "SIMPLE MEASUREMENT, ADVANCED RESULTS"

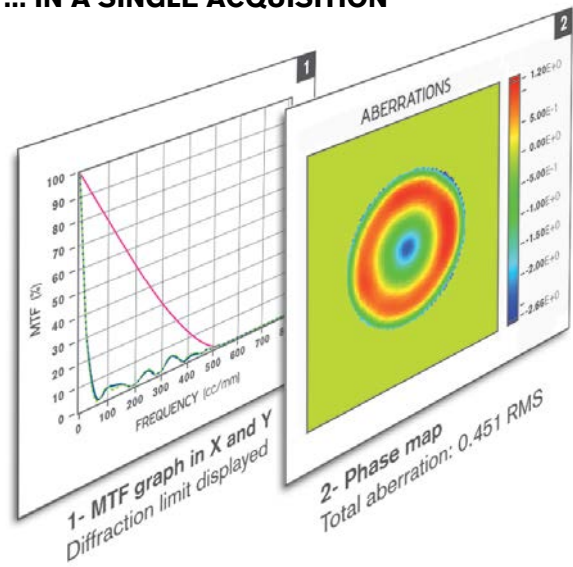
### ➤ GET THE MTF...

- Along any direction
- For any pupil size
- On and off-axis
- Up to cut-off frequency
- With various focusing methods

### ... AND WAVEFRONT QUALITY

- EFL, F#, NA
- Aberrations: Zernike, Seidel
- Real time filtering of phase map (Zernike, Kernel...)
- Through focus MTF
- Comparison to design
- Chromatic aberrations

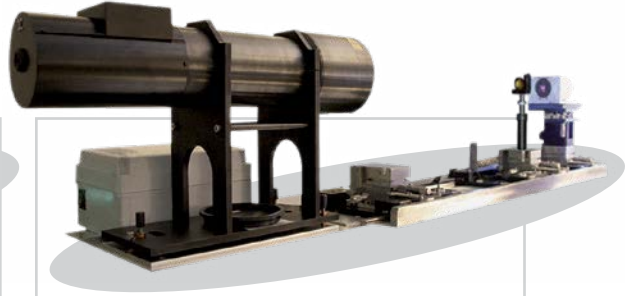
### ... IN A SINGLE ACQUISITION



**PHASICS** - The phase control company



↑ **OEM SOLUTION**



↑ **FULLY INTEGRATED BENCH**

## "A FULL RANGE OF SOLUTIONS FOR R&D AND PRODUCTION"

PHASICS provides **OEM solutions** combining the wavefront sensor and the software. PHASICS also **designs benches** fully dedicated to your needs. With its strong expertise in metrology, the company works closely with your teams to analyze all your requirements (specification, throughput, budget...) and builds custom solutions mixing the right

elements from its large collection of solutions (alignment tools, choice of configuration and measurement conditions, analysis tools...). **Dedicated software packages** are developed on demand for an easy insertion in your working environment with a **special attention to safety standard** compliance and ease of use for production.

### ↘ OVER THE LARGEST SPECTRUM FROM UV TO FAR IR

|  | UV HR         | Visible       | Visible-HR    | SID4 IR-MCT     | DWIR                      | LWIR 640        |
|--|---------------|---------------|---------------|-----------------|---------------------------|-----------------|
| <b>Wavelength range</b>                    | 190–400 nm    | 350–1100 nm   | 350–1100 nm   | 1,2–5µm         | 3–5 & 8–14 µm             | 8–14 µm         |
| <b>Aperture dimension (mm<sup>2</sup>)</b> | 8.0 x 8.0     | 3.6 x 4.8     | 8.9 x 11.8    | 9.6 x 7.68      | 13.44 x 10.08             | 16 x 12         |
| <b>Spatial resolution</b>                  | 32 µm         | 29.6 µm       | 29.6 µm       | 60 µm           | 140 µm                    | 100 µm          |
| <b>Phase and intensity sampling</b>        | 250 x 250     | 160 x 120     | 300 x 400     | 160 x 128       | 96 x 72                   | 160 x 120       |
| <b>Accuracy (Absolute)</b>                 | 10 nm RMS     | 10 nm RMS     | 10 nm RMS     | 10 nm RMS       | 75 nm RMS                 | 75 nm RMS       |
| <b>Sensitivity</b>                         | 0.5 nm RMS    | 3 nm RMS      | 2 nm RMS      | 3 nm RMS        | 25 nm RMS                 | 25 nm RMS       |
| <b>Acquisition rate</b>                    | 30 fps        | 60 fps        | 10 fps        | 140 fps         | 50 fps                    | 24 fps          |
| <b>Analysis rate (Full resolution)</b>     | 1 fps         | > 10 fps      | > 3 fps       | 20 fps          | 20 fps                    | < 10 fps        |
| <b>Dimensions (W x H x L) (mm)</b>         | 95 x 105 x 84 | 49 x 35 x 110 | 76 x 63 x 132 | 135 x 140 x 240 | 85 x 116 x 179            | 96 x 110 x 90   |
| <b>Weight</b>                              | 900 g         | 250 g         | 620 g         | ≈ 3.5 Kg        | ≈ 1.6 Kg                  | 850 g           |
| <b>Sensor technology</b>                   | CCD           |               |               | Cooled MCT      | Broadband Micro bolometer | Micro bolometer |

## ➤ DIRECT MEASUREMENT

Measuring diverging and converging beams **with no relay lens**, PHASICS sensor enables compact **direct set-up**:

- Simple alignment
- Same setup to cover your full optics range
- Characterization in working conditions
- Easy measurement interpretation

## ➔ HIGH RESOLUTION

The unrivalled high resolution of PHASICS sensor ensures **reliability**, by enabling robust calculations and small defects detection.

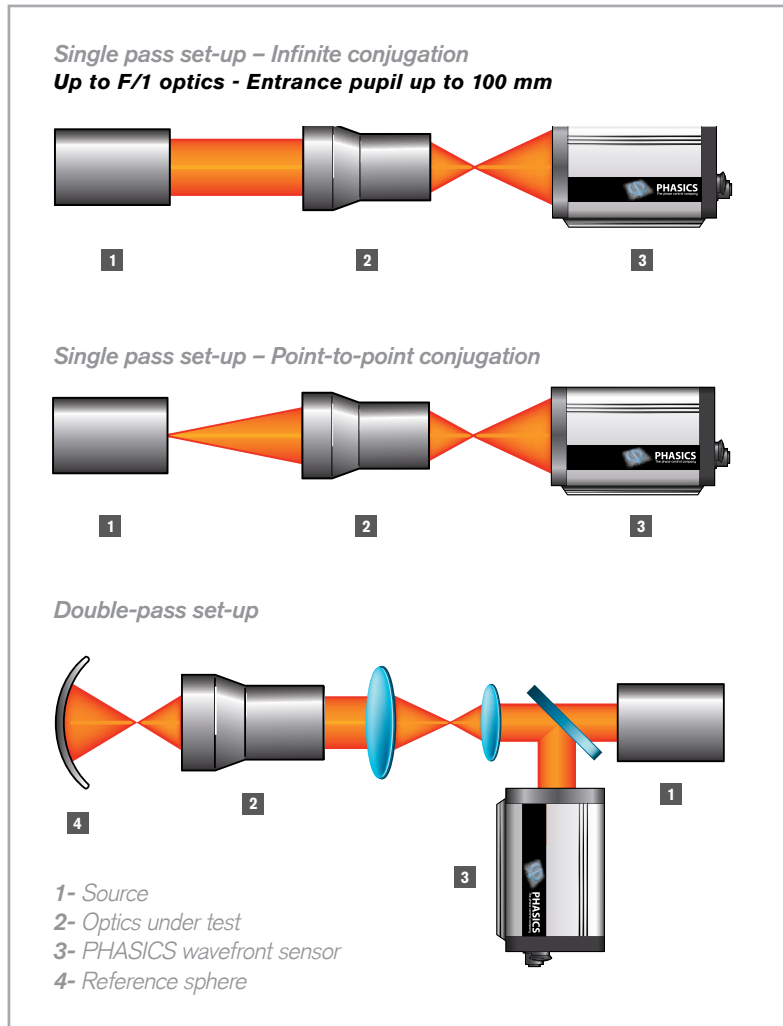
- Up to 300 x 400 measurement points
- Nanometer level axial resolution

## ➔ HIGH DYNAMICS

PHASICS sensor measures strongly **aberrated optics** to detect non-compliant **sub-assemblies** before assembly. It also measures **aspheric lenses** in transmission.

## ➔ STABILITY

PHASICS technology does not use reference beam, making it **unsensitive to vibrations**.

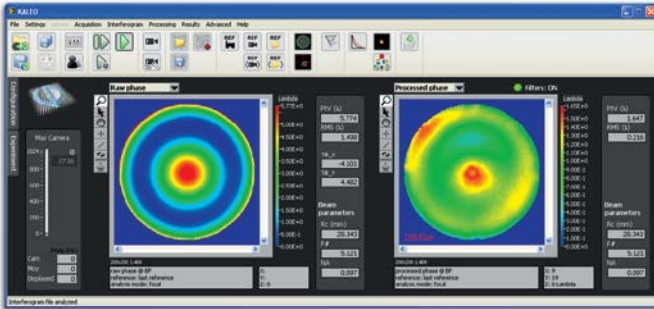


# "POWERFUL TECHNOLOGY"

## ➔ ACHROMATICITY

Inherently achromatic, PHASICS technology makes possible measurement **at any wavelength** without any calibration:

- Focus shift with wavelength
- MTF comparison at various wavelengths



Serving the ease of use of PHASICS solution, it manages measurement from settings and acquisition to advanced calculations: Lens database - Alignment helpers - Automated reports

## "EXPERT ANALYSIS SOFTWARE"

### ← EASY AND RIGOROUS ANALYSIS

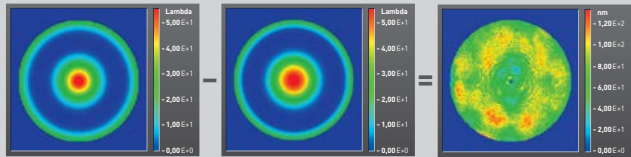
Taking advantage of our technology, the software solution ensures **reliable** calculation and offers **flexibility**:

- focusing methods (best or paraxial focus, MTF autofocus)
- pupil size
- advanced filtering options

Direct phase measurement makes possible **advanced analysis** while **simplifying the result interpretation**.

### DESIGNPRO MODULE →

From the optical design file, this module simulates the nominal phase in the measurement plane and delivers the **residual wavefront error (WFE)**



Measured phase  
PV=57.4λ

Simulated wavefront  
from Zemax design

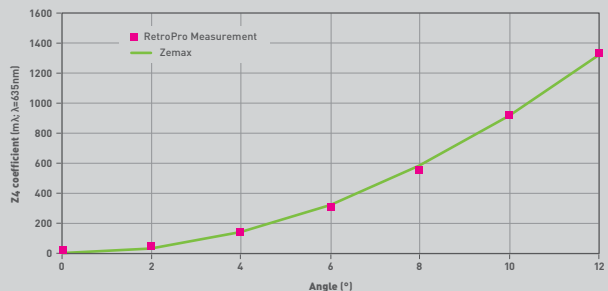
Residual wavefront

Residual wavefront for a single CVX lens (PV=130 nm)

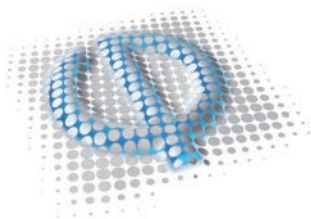
### RETROPRO MODULE →

Direct measurement enables back propagating the measured wavefront to provide the **OPD information in the exit pupil** of the tested element. The measurement can then easily be compared to optical design. It is of real interest for **off axis** measurement interpretation.

### Evolution of Astigmatism in the field



MTF and Zernike coefficients can be provided in the exit pupil of the optical element for on and off axis measurement, thus enabling an easy comparison to design data



**PHASICS S.A.**

XTEC Bât. 404  
Campus de l'Ecole Polytechnique  
Route de Saclay  
91128 Palaiseau - France  
Tel : +33(0)1 69 33 89 99  
Fax : +33(0)1 69 33 89 88  
E-Mail : [contact@phasics.fr](mailto:contact@phasics.fr)  
[www.phasics.fr](http://www.phasics.fr)