

PhaseCam™

Model 4000-MW

High performance
Dynamic Twyman Green
Interferometer



Breakthrough Technology

The PhaseCam™ 4000-MW is a new, high performance dynamic multiple-wavelength Twyman-Green interferometer system. The system incorporates an innovative, single camera, high-speed optical phase sensor with the ability to synthetically increase the effective wavelength through multiple wavelength measurements. This breakthrough sensor technology makes the system insensitive to vibration and air turbulence. The PhaseCam 4000-MW captures a full wavefront measurement in as little as 30 microseconds, which is over 5,000 times faster than any conventional temporal phase shifting interferometer. Typical multiple-wavelength measurements can be acquired in less than 100 microseconds.

The system's multiple wavelength measurements are ideal for measuring the height of large step discontinuities that exceed the quarter wavelength limitation of single wavelength interferometers. This is especially important in applications such as measuring and phasing of the next generation of segmented telescope mirrors. The increased dynamic range afforded by the multiple-wavelength measurements allows the segments to be phased while high precision measurements of the surface are returned. Additionally, the high-speed data acquisition enables measurements in vibrationally unstable environments. Consequently, the PhaseCam 4000-MW is ideally suited for applications such as in-line process control where vibrations prohibit the use of conventional temporal phase-shifting interferometry and large dynamic range metrology of the relative tilt and height of MEMS array elements.

Accessory Optics

4D Technology has a wide variety of precision accessory optics available for the PhaseCam 4000-MW, as well as other precision components to anticipate almost any need.

The System

The PhaseCam 4000-MW is a turn-key instrument that includes the interferometer mainframe, 4Sight™ advanced wavefront analysis software, a high-speed Pentium IV computer system with an LCD monitor and the laser control electronics. Samples with any reflectivity from 1% to 100% can be performed with a simple turn of a dial. The PhaseCam 4000-MW system's ease of use, speed, reliability, and accuracy eliminates tedious re-testing caused by phase and integration errors common to temporal phase shifting systems.

4Sight™ Software

The next generation wavefront analysis software package, 4Sight™ features a user-friendly intuitive interface that is unmatched for simplicity, ease of use, and graphical display. The Measurement Console display aids alignment and the execution of single, averaged, burst or continuous data acquisition. Visualization of the entire measurement data flow, from raw interferogram acquisition, through masking, reference subtraction, and terms removal to phase data using a single interactive display. Perform Zernike and Seidel, geometric and diffraction analyses; save, print and export data or cut and paste results with unrivaled flexibility. The unique data stack facilitates complex manipulations and comparisons of phase maps. Comprehensive data sharing capabilities let you read and write IDL®, MatLab®, Opticode®, Vision®, HDF5®, and CodeV® compatible file types. Generating phase movies to characterize deforming surfaces and moving parts is simple and easy with a single option click.

Features

- Vibration Insensitive Dynamic Operation
- 1000 x 1000 pixel, 10 bit CCD Standard
- 30µs Data Acquisition Time (single frame)
- Single Camera, High-Speed Optical Phase Sensor

Applications

- Multi-Segment Mirror Phasing
- Optical Metrology of Large Optical Components
- Vacuum and Environmental Chamber Tests
- Metrology on Automated Manufacturing Machines
- Optical Testing of Moving Parts



Note: IDL®, MatLab®, Opticode®, Vision®, HDF5®, and CodeV® are registered trademarks of their respective owners.

For a demonstration of this and other products, call Sales at 800-261-6640

PhaseCam™

Specifications

Configuration

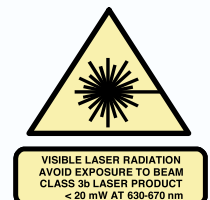
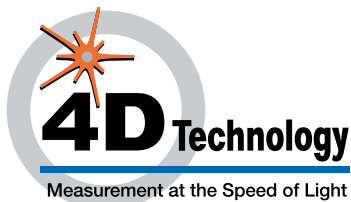
Model 4000 MultiWave

Description	Turn-key vibration insensitive Multiple-Wavelength Twyman-Green interferometer
Acquisition Mode	Single camera, high-speed optical phase sensor
Laser Sources	Fixed Laser Diodes at 637nm and 660nm and a Tunable Laser Diode
Wavelength Range	from 633nm to 637nm
Synthetic Wavelength Range	18microns to 10mm
Maximum Cavity Length	> 50 m
Beam Diameter	>7.0 mm collimated
Polarization	Circular
Pupil Focus Range	±12.5 mm
Pupil Magnification	Fixed
Fringe Contrast	User adjustable, attenuator not required for high reflectance optics
Camera	1K x 1K
Data Array	User selectable Full, Half, Quarter data arrays
Cables	Laser supply/control, camera and power cables
Computer System	Pentium IV Minimum configuration: 3 GHz, 2 GByte RAM, 80 GByte Hard Drive, CDRW, 19" LCD, mouse, keyboard
Operating System	Windows XP
System Software	4Sight™ Version 1.3 or later, with User Manual Instantaneous Phase Shifting data acquisition Fringe display / Exposure control On the fly data processing with terms / reference removal Reference generation, subtraction, data averaging, masking 2D and 3D surface maps Zernike / Seidel / Slope / Geometric / Fourier Analysis Fiducial aided data set mapping HDF4 / HDF5 data format standard, others supported Absolute sphere, prism & corner cube analysis Multiple sub-aperture and step height analyses Upgrades – free during warranty period
Physical Envelope	< 17 x 36 x 102 cm (6.5x14x40 inch) nominal
Weight	< 40 Kg
Power consumption	< 750 Watts
Temperature Range	Operational: 60 - 80 deg F, non-condensing
Storage	30–100 deg F, non-condensing
Warranty	One Year, limited; on-site system installation/operator training included
Options	Aperture Options 25 mm, 50 mm (others on request)
System Performance	(Fundamental Wavelength)
Acquisition Rate	>10 frames/sec display; 4 interferograms/frame >25 frames/sec max data acquisition with post processing
Minimum Exposure	6 microseconds AOM, 30µs/frame effective for high reflector
Sample Reflectivity	1 to 100%
RMS Repeatability	<0.001 wave*
RMS Precision	<0.002 wave**

*One sigma for RMS of 10 data sets of calibration mirror, each data set being an average of 16 measurements.

**Average RMS of the difference of 10 data sets between measured surface and the calibrated surface. Each data set being an average of 16 measurements. Calibrated surface is the pixel by pixel average of 10 measurements of calibration mirror.

All specifications subject to change without notice.



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