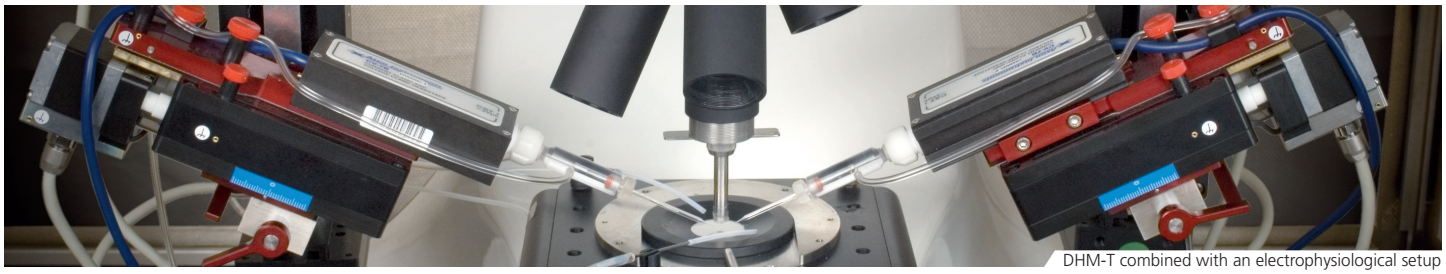
DHM® - T series

Transmission configured Digital Holographic Microscope (DHM®) for applications in life science and material science: a unique experimental set-up enabling characterization of light transmitting samples.



DHM-T combined with an electrophysiological setup

Biological Imaging

Label-free biological microscopy

DHM® enables non-toxic quantitative measurements of individual living cells and cultures up to confluence:

- Time-lapse
- Multi-well plate screening
- Diagnostic

Investigate unexplored biological processes

The quantitative phase measurement of DHM® can be interpreted in terms of many underlying biological processes:

- Channel activity
- Cell viability
- Intracellular concentration
- Morphology changes

Perform multimodal imaging

An optional module enables simultaneous DHM® and fluorescence measurements:

- Correlate DHM® measurements with well known measurement protocols
- Use the DHM to decrease the number of necessary fluorescence labelling
- Enhance understanding of cellular mechanism

Optical Profilometry

Transmission configured optical profilometer

The transmission DHM® enables the measurement of multiple sample characteristics:

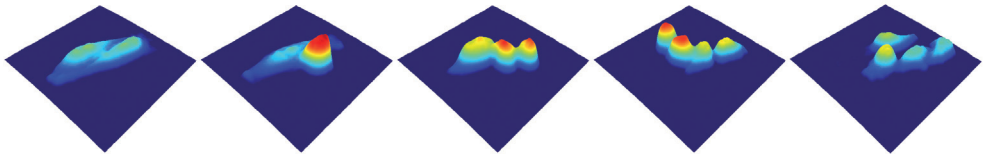
- Sample optical topography
- Thickness variability
- Size and location of internal structures and defects
- Refractive indices and concentration
- Birefringence

Investigate innovative materials and devices

The benefits with fast dynamical measurement have been demonstrated in numerous applications:

- Micro-optics
- Micro-fluidics
- Stress and constraints analysis
- Liquid Crystal Displays (LCD)
- Biophysics
- Wettability of coatings and structures
- Fluids and gas dynamics
- Dissolution and crystallization
- Particle velocimetry

time ····►



Time sequence of 3D optical map of quantitative phase measurement , limited by camera rate: division of HeLa cells

DHM®

The Digital Holographic Microscopy (DHM®) is a patented technology. It records, with a digital camera, holograms produced by the interference between the beam transmitted through the sample, and a reference beam generated inside of the microscope. The holograms are processed numerically to reconstruct a 3D optical map of the specimen.

The vertical calibration of DHM® is intrinsically defined by the laser wavelength. It provides high accuracy and reproducible data and measures with interferometric resolution, i.e. a subnanometric vertical resolution, and a lateral resolution limited by the choice of microscope objective.

Thanks to advanced numerical processing of the recorded hologram, sharp focus can be performed simultaneously or after measurement, as a post-processing without manually adjusting the height of the sample.

Please visit **www.lynceetec.com** and contact us for more information and examples of applications.

lyncée tec DHM
Innovation Park, Batiment A
1015 Lausanne
Switzerland
info@lynceetec.com
www.lynceetec.com

Represented by

Two configurations of Transmission DHM® are available, differentiated by the number of wavelengths.

→ **T1000 models are configured with a single wavelength and are the ideal tool for studying simple living cells as well as measuring transparent material samples with smooth surfaces**

→ **T2100 models are configured for measuring simultaneously at two wavelengths, extending measurement capability**

Technical specifications

System		
DHM models	T1000	T2100
Number of laser sources	1	2
Operating wavelength (± 1.0 nm)	666 nm	666 nm, 794 nm
Laser wavelength stability	0.01 nm/°C at 675 nm	
Sample stage	Manual or motorized XYZ stages 114 mm x 76 mm x 38 mm travel range	
Objectives	Magnification 1.25x to 100x, standard, high NA, long working distance, water/oil immersion	
Objective & condenser turret	6 positions	
Computer	Workstation with latest multicore Intel® processor, high performance graphic card, optimized and configured for DHM with screen min 21inch and mouse	
Software	Proprietary Koala software based on C++ and .NET Additional optional software modules available for advanced analysis	
Data compatibility	Measurement data recorded in bin format, exportable in .txt format, recorded and reconstructed images exportable in .tif format or .txt array	

Performance		
Measurement mode	Single wavelength at 666 nm	Short synthetic wavelength at 8 µm [4]
DHM models	T1000, T2100	T2100
Accuracy [1] [nm]	1.0 [4]	1.0 / 5.0 [4] *
Vertical resolution [2] [nm]	2.0 [4]	2.0 / 10.0 [4] *
Repeatability [3] [nm]	0.02 [4]	0.02 / 0.05 [4] *
Vertical measuring range	up to 500 µm [4]	up to 500 µm [4]
Max. height of steps with sharp edges [6]	up to 1.0 µm [4] up to 3.5 µm [5]	up to 7.0 µm [4] up to 22 µm [5]
Vertical calibration	Determined by interferometric optical filter, ±0.1 nm	
Acquisition time	Standard: 500 µs (optional 10 µs)	
Acquisition rate	Standard: 190 fps (1024 x 1024 pixels). (optional up to 100'000 fps).	
Reconstruction rate	Up to 25 fps 1024 x 1024 pixels hologram (data analysis dependent). (optional up to 60 fps)	
Lateral resolution	Objective dependent, down to 300 nm**	
Field of view	Objective dependent, from 66 µm x 66 µm up to 5 mm x 5 mm**	
Working distance	Objective dependent, from 0.3 to 18 mm**	
Digital focusing range	Up to 50x depth of field (objective dependent)	
Sample illumination	Down to 1 µW/cm2	

Power requirements	
Input voltage	85-260 VAC – 50/60 Hz
Power requirements	max. 250 W

Dimensions & weight	
Dimensions (L x W x H)	600 x 350 x 500 mm
Weight	30 kg

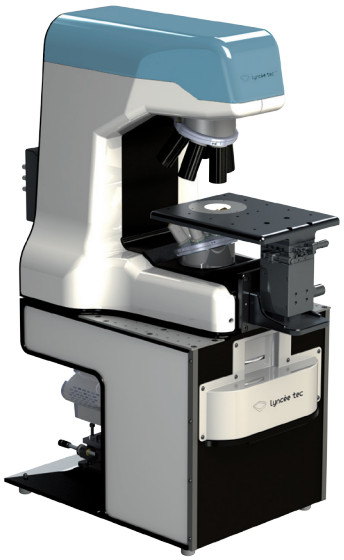
1 As demonstrated by taking the temporal standard deviation on 1 pixel over 30 measurements
2 Defined as twice the accuracy
3 As demonstrated by taking the one sigma Rq value of 30 repeatability measurements without sample
4 Converted value for measurements in air and with sample refractive index n = 1.5
5 Converted value for measurements in water and with sample refractive index n = 1.5
6 Depends on the laser source(s) and operating wavelength(s)

* With / Without single wavelength mapping

** Objectives specifications on www.lynceetec.com/microscope-objectives

DHM® systems are compatible with a large choice of options

- Objectives with extra-LWD, cover-glass correction, for immersion, etc.
- Motorized stage for automation and stitching
- Remote TCP/IP module for automation and remote control of DHM
- Stroboscopic unit for MEMS analysis
- Dipping tip for immersion measurement in well plate and open chambers
- Fluorescence module to combine DHM with epifluorescence measurements
- High-speed camera to extend measurement capabilities



Transmission DHM® combined with a Fluorescence module