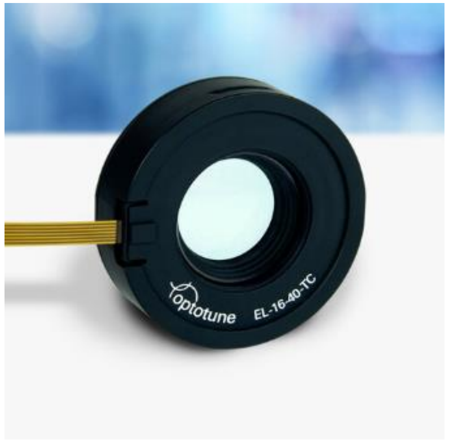
新特光电
Sintec Optronics

solutions for microscopy

Product portfolio

Our solutions to enhance your microscopes

Focus tunable lenses

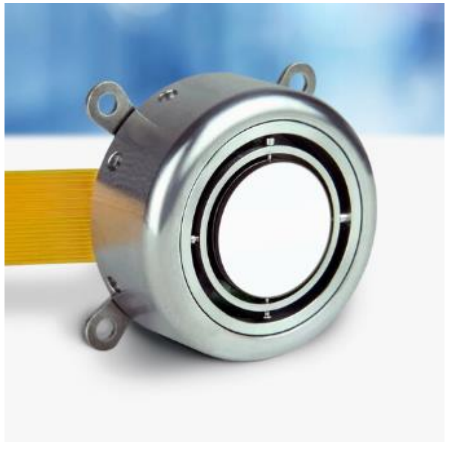


- Fast autofocus
- Fast detection
- Image stacking

Laser speckle reducers

- Homogeneous laser illumination field
- Noiseless
- Compact

Beam steering devices



- Sole reflection
- Wide angular range
- Compact

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Current situation

How do we move from 2D to 3D

Goals

- Imaging of 3D cell cultures
- Imaging of whole embryos
- In-vivo imaging

Limitations

- Depth of field DOF
- Mechanical vibrations
- Focusing speed

Solution

- 3D microscope

Current solutions

To focus along Z-axis

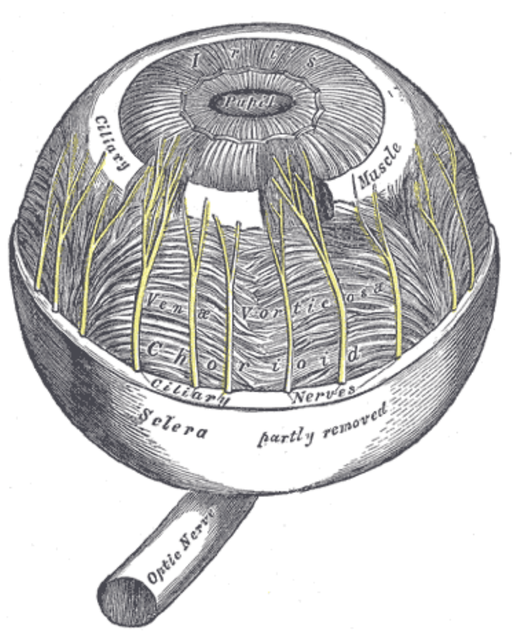
	Motorized Z	Piezo Z	Focus Tunable Lens	
Price	$$	$$$	$	3x cheaper than piezo’s
Speed	+	+++	+++ (100Hz)	100x faster than motorized Z
Travel Range	+++	+	++	e.g. 600 µm with 40x objective
Compactness	+	++	+++	No table-top controller
Vibrations	+	+	+++	No vibrations
Thermal Drift	+	+	+++	Temp. comp. sensor

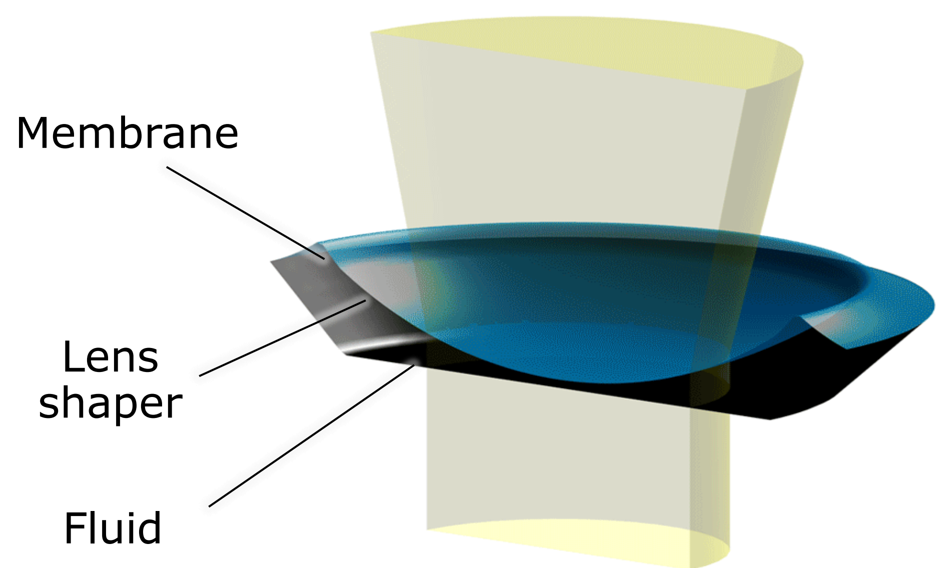
Working principle

Membrane with fluid and actuator

Human eye:
Ciliary muscle actuates
the lens curvature

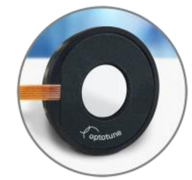
Optotune lens:
Electromagnetic actuator
controls the lens curvature





Our product range

Liquid lenses for microscopy applications

	EL-3-10-TC	EL-10-30-TC	EL-10-30-C(i)	EL-12-30-TC	EL-16-40-TC
					
Focal power range (dpt)	-13 to +13	+8 to +22	-1.5 to +3.5 +5 to +10	-5 to +5	-2 to +3 -10 to +10
Clear aperture (mm)	3	10	10	12	16
Outer diameter (mm)	10	30	30	30	40
Rise / settling time (ms)	1 / 4	2.5 / 20	2.5 / 15	5 / 25	5 / 25
Repeatability (dpt)	N/A	< 0.1	< 0.1	< 0.1	< 0.1
Typical use case	Hand held devices	Conventional microscopes	Conventional microscopes	Portable microscopes	High end imaging systems

Our controllers

Fast plug & play for easy integration

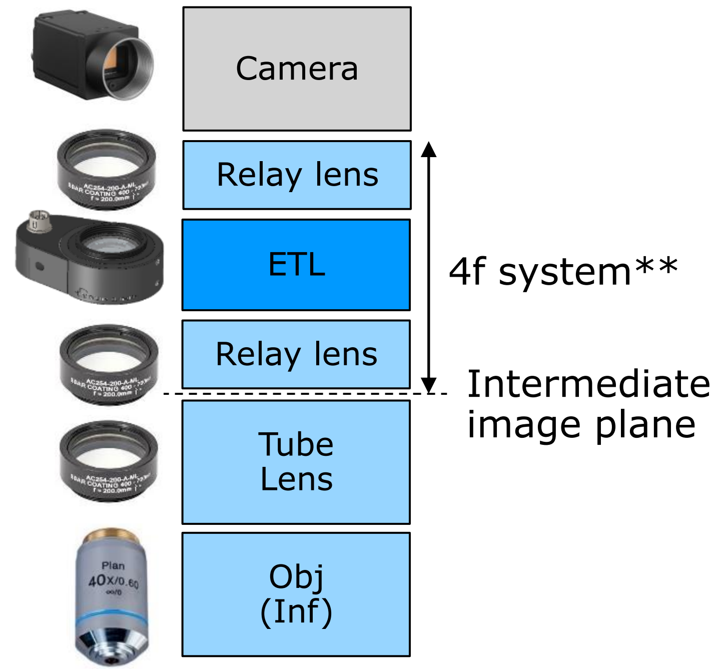
	EL-E-4	EL-E-4i	ICC-4-C	Gardasoft CL-180	Gardasoft CL-160
					
Application	R&D, portable systems	R&D, portable systems	Industrial 24/7 operation	Industrial 24/7 operation	OEM
Current range (mA)	-290 to + 290	-290 to + 290	-500 to +500	-400 to +400	-290 to +290
Supply Voltage (V)	5	5	24	24	3.3 - 5
Interfaces	USB	USB	USB, Ethernet, Analog, UART, I2C	GigE, RS232, Analog	I2C, UART, Analog
Connection	FPC	Hirose	Hirose	Hirose	-
Channel(s)	1	1	4	1	1
SDKs	C#, LabVIEW, Python	C#, LabVIEW, Python	C#, Python	Triniti SDK, C#, C++, VB	

Integration of liquid lenses in microscopes

Non-telecentric

	Z-range with 5D lens	Mag change*
10x	2560 µm (20D: 10240µm)	7.5%
20x	640 µm (20D:2560 µm)	12.2%
40x	160 µm (20D:640 µm)	23.7%

Telecentric



	Z-range with 5D lens	Mag change
10x	1000 µm	0%
20x	250 µm	0%
40x	60 µm	0%

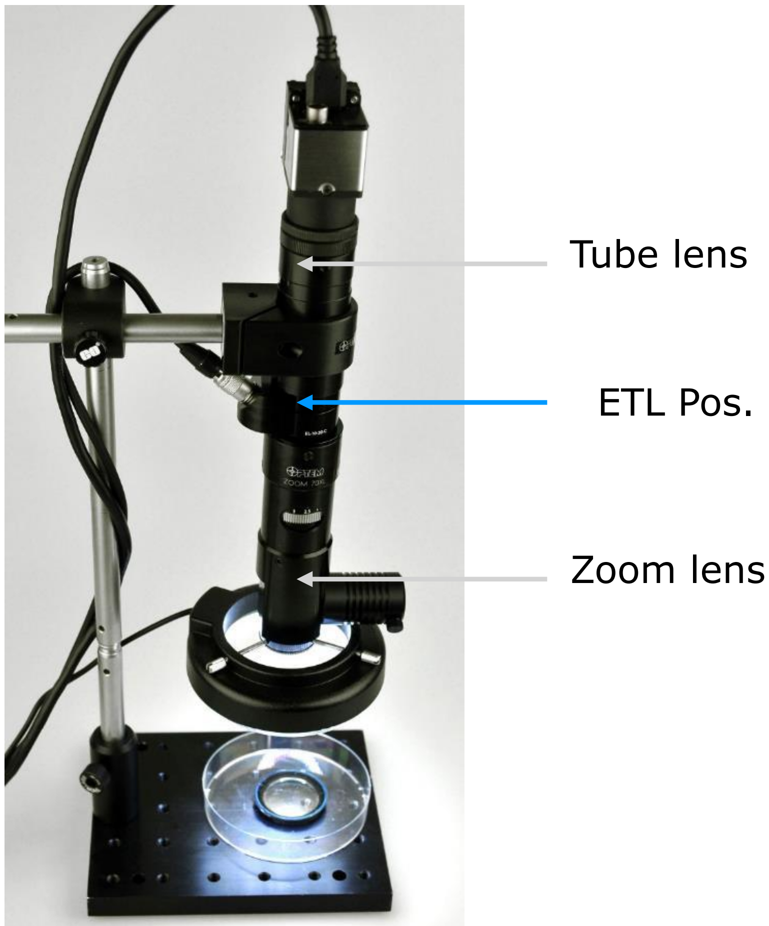
* Magnification changes are linear, it is possible to compensate it via software

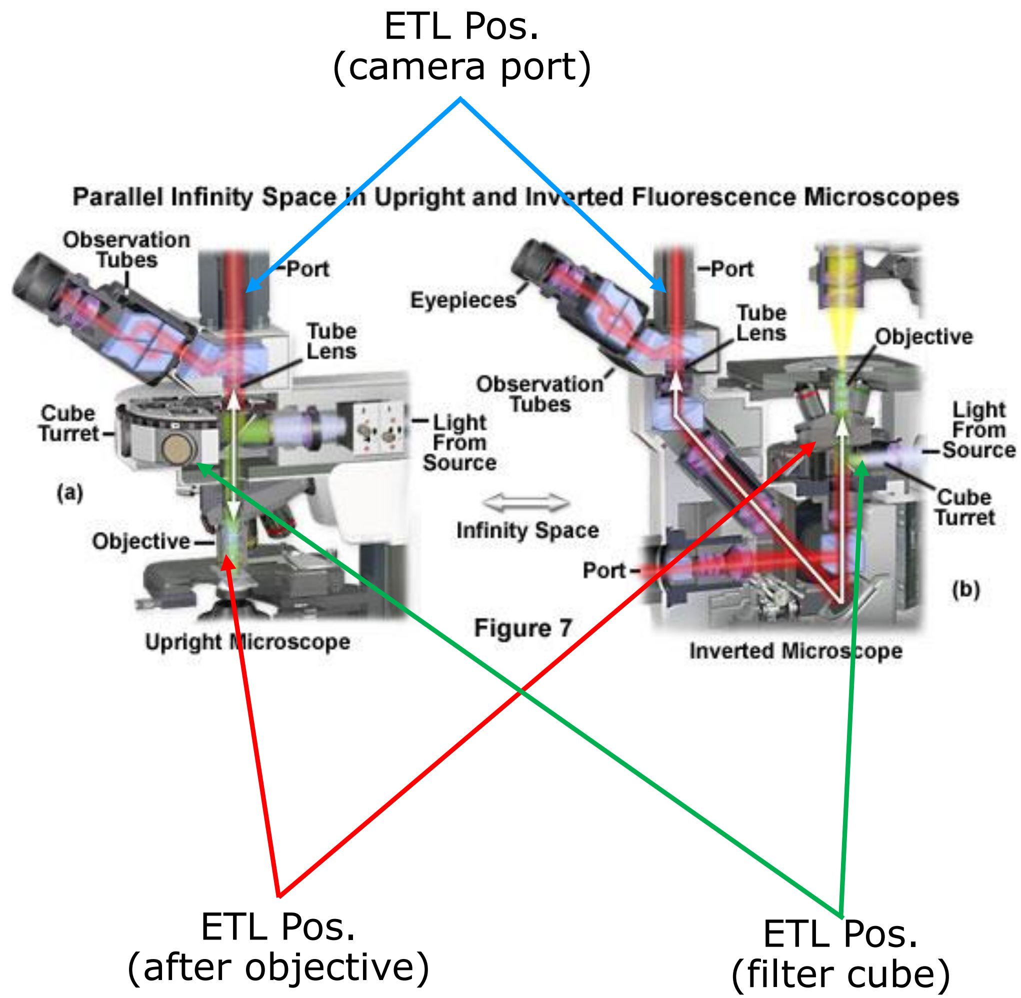
** To eliminate the magnification changes, a 4f system with a custom telecentric tube lens is required

Integrations

How ETL can become part of your systems

Digital inspection microscope	Scientific microscope





Techniques overview

Different techniques, different applications

3D Microscopy

Wide-Field

Two-Photon

Digital Microscopy

Confocal

Light Sheet

Raman Spectroscopy

Integration: microscopy examples

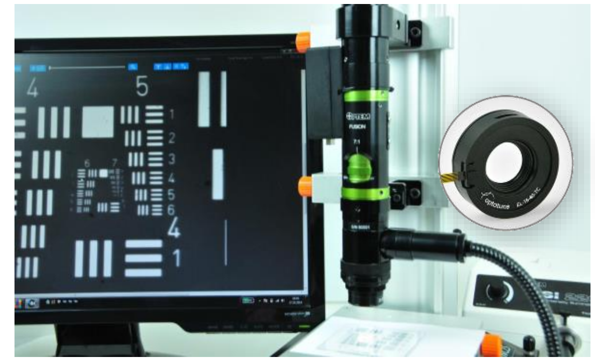
Collaboration with our partners

Edmund optics | worldwide

NAVITAR

QIOPTIQ Photonics for Innovation

An Excelitas Technologies Company



sanxo

Mvotem Optics ®

慕藤光

HeliconSoft

Integration example:
Tucsen microscope – automated zoom & focus

- Lens control fully integrated into system software
- Tunable lens: EL-10-30

Off the shelf Z-focus solutions

Based on Optotune EL-10-30 and EL-16-40

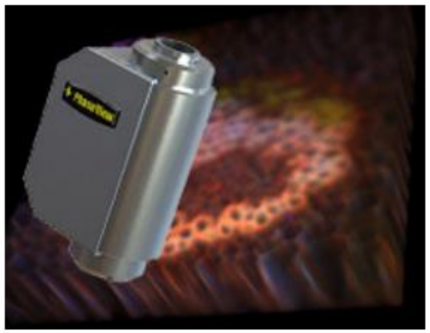
Life Sciences & Scientific Imaging

Microscopy Volume Imaging Solutions

Industries & Quality Control

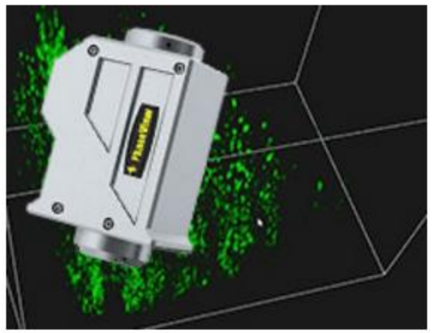
3D Solutions For Microscopes And Automated Vision Systems

PhaseView®



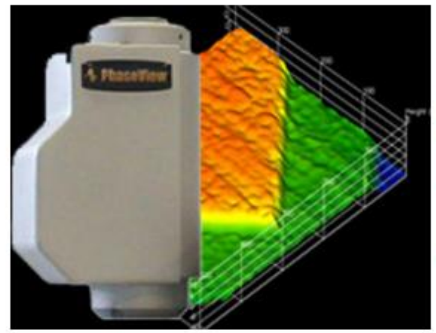
NeoScan

Fast Volume Scanning



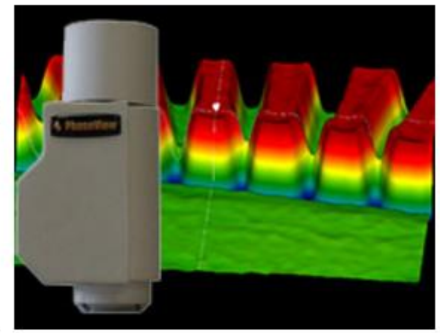
ThunderScan

Ultra High Speed Scanning



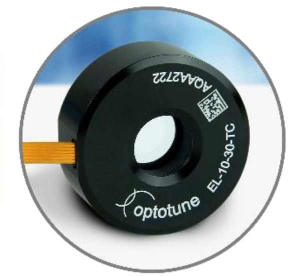
ZeeScan

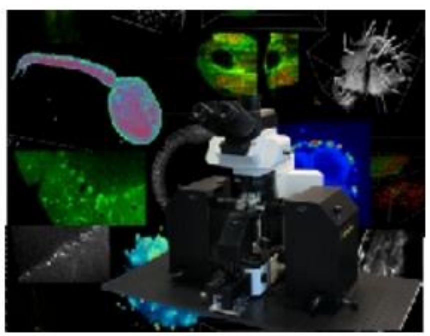
3D Add-On for microscopes



ZeeCam

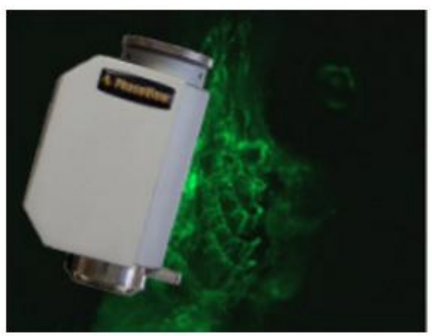
3d microscope camera





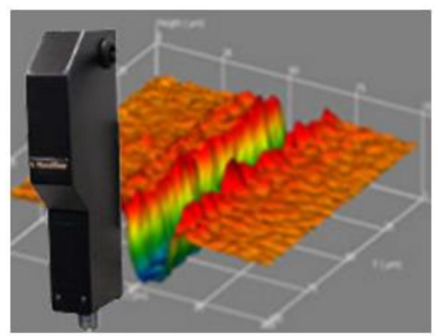
Alpha^3

Light Sheet Microscope



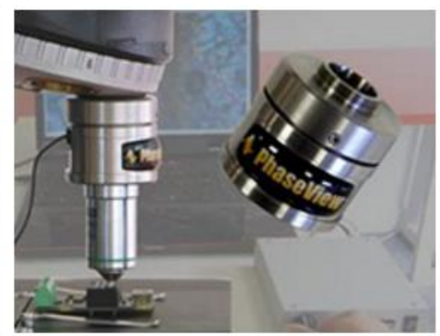
InSight

Real Time 3D Acquisition



ZeeScope

3d measurement microscope



SmartScan

Motorless focus control

Preferred partner to develop new technologies

Publications using Optotune Lenses for Microscopy

Four-dimensional visualization of zebrafish cardiovascular and vessel dynamics by a structured illumination microscope with electrically tunable lens

Chen Chong, Li Simin, Wen Gang, Liang Yong, Wang Linbo, Yang Guang, Jin Xin, and Li Hui, Biomed. Opt. Express 11, 1203-1215 (2020) https://doi.org/10.1364/BOE.382114

Speeded-Up Focus Control of Electrically Tunable Lens by Sparse Optimization

Iwai, D., Izawa, H., Kashima, K. et al. Speeded-Up Focus Control of Electrically Tunable Lens by Sparse Optimization. Sci Rep 9, 12365 (2019). https://doi.org/10.1038/s41598-019-48900-z

Large depth-of-field 3D shape measurement using an electrically tunable lens

Xiaowei Hu, Guijin Wang, Yujin Zhang, Huazhong Yang, and Song Zhang, Opt. Express 27, 29697-29709 (2019) https://doi.org/10.1364/OE.27.029697

Experimental validations of a tunable-lens-based visual demonstrator of multifocal corrections

Vyas Akondi, Lucie Sawides, Yassine Marrakchi, Enrique Gambra, Susana Marcos, and Carlos Dorronsoro, Biomed. Opt. Express 9, 6302-6317 (2018) https://doi.org/10.1364/BOE.9.006302

Cell mechanotransduction with piconewton forces applied by optical tweezers

Fabio Falleroni, Vincent Torre, Dan Cojoc, Frontiers in cellular nanoscience (2018), https://doi.org/10.3389/fncel.2018.00130

All-optical microscope autofocus based on an electrically tunable lens and a totally internally reflected IR laser

M. Bathe-Peters, P. Annibale, and M. J. Lohse, Optics Express Vol. 26, Issue 3, pp. 2359-2368 (2018), https://doi.org/10.1364/OE.26.002359

Three-dimensional Two-photon Optogenetics and Imaging of Neural Circuits in vivo

B. W. Yang, L. Carrillo-Reid, Y. Bando, D.S. Peterka, R. Yuste, bioRxiv preprint (2017). https://doi.org/10.1101/132506

NeuBtracker—imaging neurobehavioral dynamics in freely behaving fish

B. P. Symvoulidis, A. Lauri, A. Stefanoiu, M. Cappetta, S. Schneider, H. Jia, A. Stelzl, M. Koch, C. C. Perez, A. Myklatun, S. Renninger, A. Chmyrov, T. Lasser, W. Wurst, V. Ntziachristos, G. G. Westmeyer, Nature Methods - Brief communication (2017). doi:10.1038/nmeth.4459

High-speed dual-layer scanning photoacoustic microscopy using focus tunable lens modulation at resonant frequency

B. K. Lee, E. Chung, S. Lee, T. J. Eom, Optics Express, Vol 22, pp. 26427 (2017). doi.org/10.1364/OE.25.026427

Quantifying three-dimensional rodent retina vascular development using optical tissue clearing and light-sheet microscopy

B. J. N. Singh, T. M. Nowlin, G. J. Seedorf, S. H. Abman, D. P. Shepherd, J. Biomed. Opt., Vol 22, Issue 7, (7), pp. 2035-2046 (2011). doi:10.1117/1.JBO.22.7.076011

Three-dimensional multiple-particle tracking with nanometric precision over tunable axial ranges

B. G. Sancataldo, L. Scipioni, T. Ravasenga, L. Lanzanò, A. Diaspro, A. Barberis, and M. Duocastella, Optica Vol. 4, Issue 3, pp. 367-373 (2017)

Reduction of coherent artefacts in super-resolution fluorescence localisation microscopy

A. P. Georgiades, V. J. Allan, M. Dickinson, T. A. Waight, Journal of Microscopy (2016); doi: 10.1111/jmi.12453

High-speed microscopy with an electrically tunable lens to image the dynamics of in vivo molecular complexes

Y. Nakai, M. Ozeki, T. Hiraiwa, R. Tanimoto, A. Funahashi, N. Hiroi, A. Taniguchi, S. Nonaka, V. Boilot, R. Shrestha, J. Clark, N. Tamura, V. M. Draviam and H. Oku, Rev. Sci. Instrum. 86, 013707 (2015)

Multi-depth photoacoustic microscopy with a focus tunable lens

Kiri Lee, Euiheon Chung, Tae Joong Eom, Proc. of SPIE Vol. 9323 93233O-1 (2015)

Calcium transient prevalence across the dendritic arbour predicts place field properties

M. E. J. Sheffield, D. A. Dombeck, Nature 517, 200–204 (2015)

3d high- and superresolution imaging using single-objective SPIM

Remi Galland et al., Nature Methods 3402, 1-4 (2015)

Fast imaging of live organisms with sculpted light sheets

A. K. Chmielewski, A. Kyrsting, P. Mahou, M. T. Wayland, L. Muresan, J. F. Evers & C. F. Kaminski, Scientific Reports 5, Article number: 9385 doi:10.1038/srep09385 (2015)

A rapid image acquisition method for focus stacking in microscopy

D. Clark, B. Brown, Microscopy Today, Volume 23, Issue 04, pp 18-25 (2015)

Rapid quantitative phase imaging for partially coherent light microscopy

B. José A. Rodrigo and Tatiana Alieva, Optics Express, Vol. 22, Issue 11, pp. 13472-13483 (2014)

Investigation of diffraction-based measurement errors in optical testing of aspheric optics with digital micromirror devices

Stephan Stuerwald, Robert Schmitt, J. Micro/Nanolith. MEMS MOEMS 13(1), 1-8, (2014)

Product portfolio

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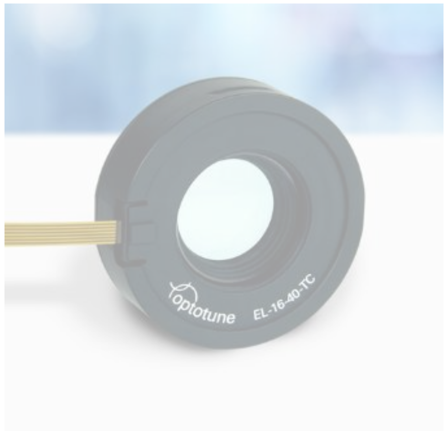


- Fast autofocus
- Focus detection
- Image stacking

Laser speckle reducers

- Homogeous laser illumination field
- Noiseless
- Compact

Beam steering devices

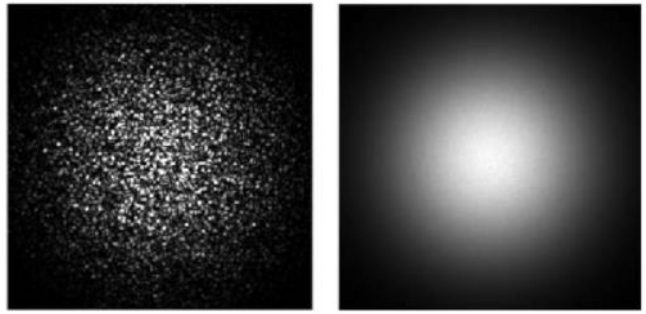
- Sole reflection
- Wide angular range
- Compact

Current situation

How do we improve laser illumination

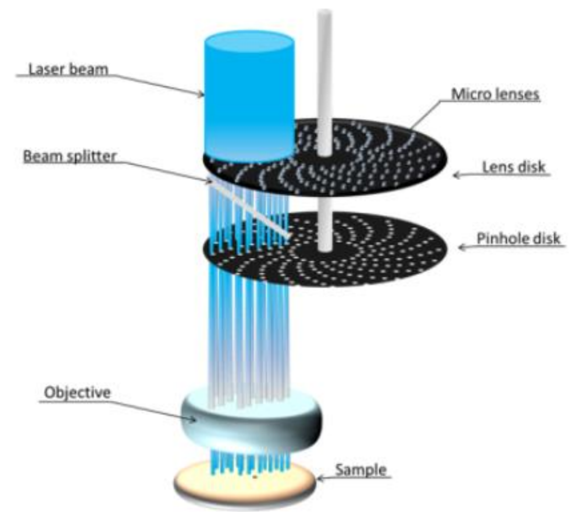
Goals

- Even illumination field
- Better contrast
- Higher image quality



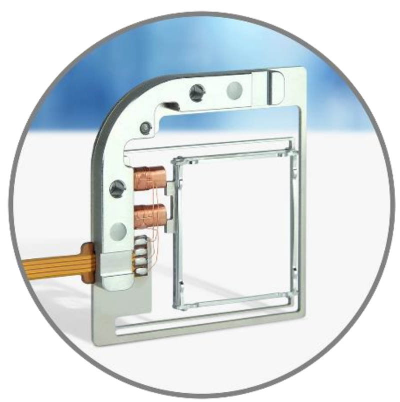
Limitations

- Noise
- Size
- Isotropic diffusers



Solution

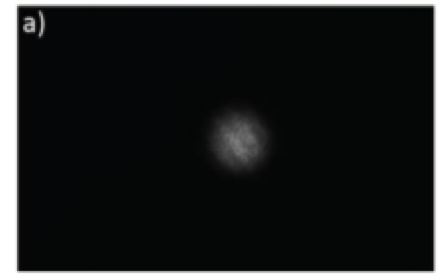
- Laser speckle reducer



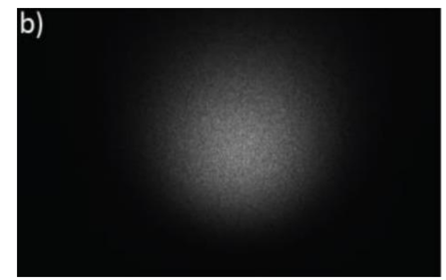
Our product range

Laser speckle reducers for laser applications

	LSR-3005	LSR-4C
Aperture	5 mm	18.5 mm
Size (L x H x D)	48x48x8.8 mm	40x40x3.8 mm
Standard diffuser angle	8.5°	8.5°
Oscillation frequency	300 Hz or 180 Hz	120 Hz +/- 10Hz
Oscillation amplitude	0.3 mm	0.8 mm
Electronics	Included	Included
Transmission	> 93	> 98 (coated) >94 (uncoated)
Operating Life time	2.000 h	> 40.000 h



No LSR – Contrast 0.27



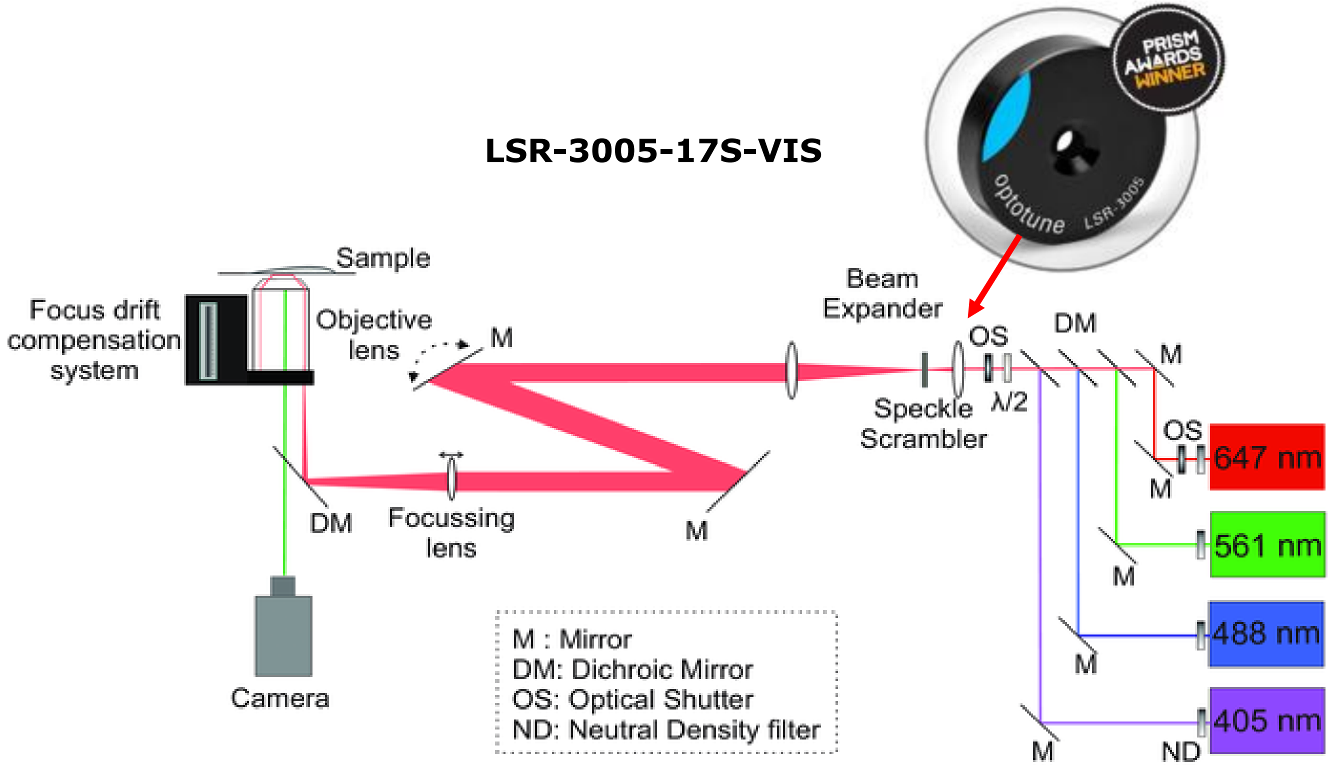
LSR OFF – Contrast 0.26

LSR ON – Contrast 0.06

Application example

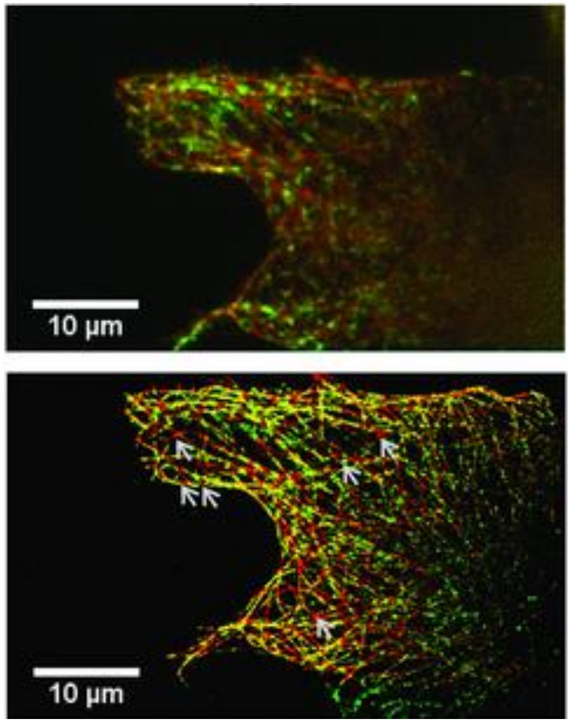
LSR boosts image quality in super-resolution fluorescence microscope

LSR-3005-17S-VIS



LSR off

LSR on



MRC5 cells stained with Alexa Fluor 647

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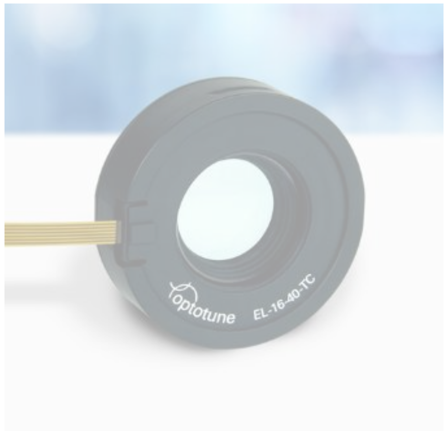

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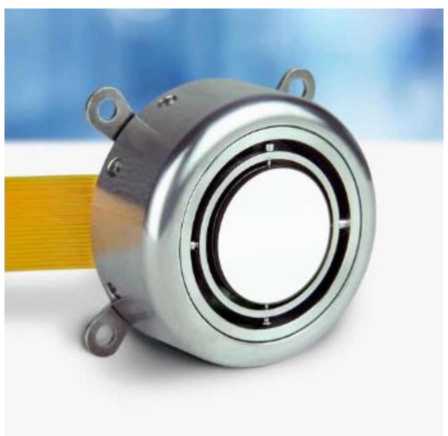


- Sole reflection
- Wide angular range
- Compact

Current situation

How do we improve your scanning system

Goals

- Change the Light Plane
- AOI selection
- Laser scanning

Limitations

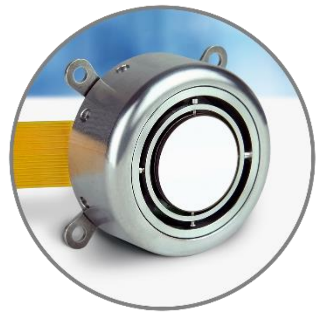
- Size
- Center of rotation not on mirror surface
- Double reflection

Solution

- 2D mirror

Our product range

2D Mirrors

	MR-15-30 standard	**MR-10-30 2 resonant axis**
		
Mirror size	15 mm	10 mm
Mechanical tilt – fast axis (half angle)	25°	12.5°
Full-scale bandwidth – fast axis	20 Hz	280 Hz
Mechanical tilt – slow axis (half angle)	25°	25°
Full-scale bandwidth – slow axis	20 Hz	20 Hz
Mech. Repeatability RMS typical	30-100 μrad	30-100 μrad (slow axis)
Footprint	30x14.5	30x14.5
Position feedback	yes	yes