

DELTA 7¹⁰

TRANSMISSIVE WAVEFRONT MODULATOR

DPP TECHNOLOGY

The Delta 7 is based on the Deformable Phase Plate (DPP) technology, exclusively developed by Phaseform GmbH. DPP is composed of a fluidic chamber, enclosed by a thin membrane, which is deformed by electrostatic force. The force is generated by a 2D array of transparent electrodes embedded within the optical aperture of the DPP. The sophisticated optofluidic design of the 10 mm aperture DPP enables gravity-neutral performance for orientation-independent, high-quality wavefront modulation.

KEY FEATURES

Complex wavefront modulation

63 electrodes enabling replication of up to the 7th radial order of Zernike polynomials (>35 modes) with high fidelity

Straightforward system integration

Compact housing compatible with standard 30 mm cage systems by rods, lens tubes, and post assemblies

Linear & hysteresis-free response

Electrostatic actuation suited for open-loop wavefront control

Remarkable optical quality

Active best flat with an induced RMS wavefront error of less than $\lambda/40$ independent of the DPP orientation

Polarization-independent

Wavefront modulation independent of the light polarization for maximized efficiency



SPECIFICATIONS

GENERAL

Modulator type	Optofluidic DPP (Deformable Phase Plate), electrostatically actuated
Clear aperture diameter	10 mm
Number of actuators	63
Number of actuators across aperture diameter	7
Connectivity	USB 2.0
Included in the Delta 7 package	Driving electronics, control software, cables, manual

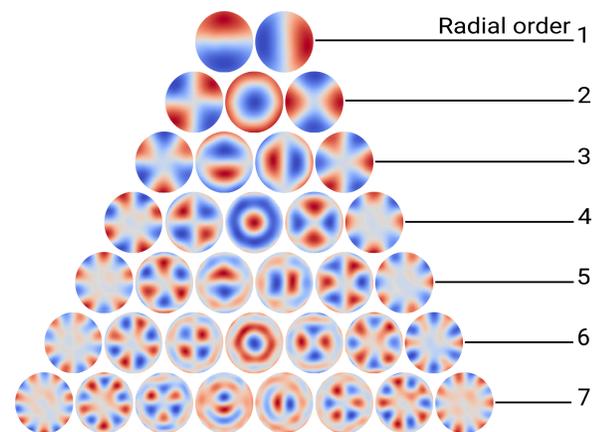
OPTICAL

Wavefront RMS error of best flat	< 15 nm (orientation independent)
Maximum peak-to-valley of the generated wavefronts	> 7 μm
Maximum spatial frequency of the correction	7th radial order of Zernike modes
Optical transmission (VIS-NIR version)	400 nm - 1700 nm (80% at $\lambda=500$ nm)
Wavefront RMS drift	< 5% after 60 min
Laser Induced Damage Threshold (LIDT)	10 W/cm ² for 10s @ 1070 nm CW

GENERATED ZERNIKE MODES IN OPEN LOOP

Max amplitude RMS, peak-to-valley, and purity of generated Zernike modes

Z (n,m)	RMS [μm]	PV [μm]	Purity [%]	Z (n,m)	RMS [μm]	PV [μm]	Purity [%]
Z (1,-1)	2	7	98	Z (5,3)	0.15	0.7	82
Z (1,1)	2	7	97	Z (5,5)	0.15	0.9	90
Z (2,-2)	1	3.8	96	Z (6,-6)	0.1	0.8	83
Z (2,0)	1	3.8	96	Z (6,-4)	0.07	0.5	70
Z (2,2)	1	3.8	96	Z (6,-2)	0.07	0.5	77
Z (3,-3)	0.5	2.5	94	Z (6,0)	0.1	0.6	77
Z (3,-1)	0.5	1.7	94	Z (6,2)	0.07	0.5	73
Z (3,1)	0.5	1.7	93	Z (6,4)	0.07	0.5	70
Z (3,3)	0.5	2.5	95	Z (6,6)	0.1	0.8	77
Z (4,-4)	0.25	1.3	93	Z (7,-7)	0.07	0.6	74
Z (4,-2)	0.25	1.1	88	Z (7,-5)	0.07	0.5	70
Z (4,0)	0.25	1.2	91	Z (7,-3)	0.07	0.5	70
Z (4,2)	0.25	1.1	86	Z (7,-1)	0.07	0.5	70
Z (4,4)	0.25	1.3	94	Z (7,1)	0.07	0.5	70
Z (5,-5)	0.15	0.9	90	Z (7,3)	0.07	0.5	70
Z (5,-3)	0.15	0.7	84	Z (7,5)	0.07	0.5	70
Z (5,-1)	0.15	0.8	80	Z (7,7)	0.07	0.6	78
Z (5,1)	0.15	0.8	80				



*Purity is defined as the fraction of the target Zernike mode relative to the root-square-sum of all modes.

**The Zernike-tree shows experimentally measured replicated Zernike modes up to the 7th order, in open-loop, using an interferometric setup.

SPECIFICATIONS, CONT.

MECHANICAL

Thickness (within clear aperture)
 Response time (best flat to maximum deformation)
 Hysteresis
 Linearity
 Mounting orientation

0.87 mm
 < 40 ms
 < 1%
 > 92%
 Arbitrary (horizontal and vertical standard, other orientations upon request)
 30 mm cage system rods, SM1 tubing, and $\varnothing=1/2"$ post
 1.5 m

Mounting capability
 Connector cable length

ELECTRICAL

Actuator voltage
 Maximum power consumption
 Power supply

up to 295 V DC
 < 9 W
 120/230 VAC

THERMAL

Storage temperature
 Operating temperature

10 °C to 35 °C
 20 °C to 25 °C

SOFTWARE

Graphical User Interface (GUI)

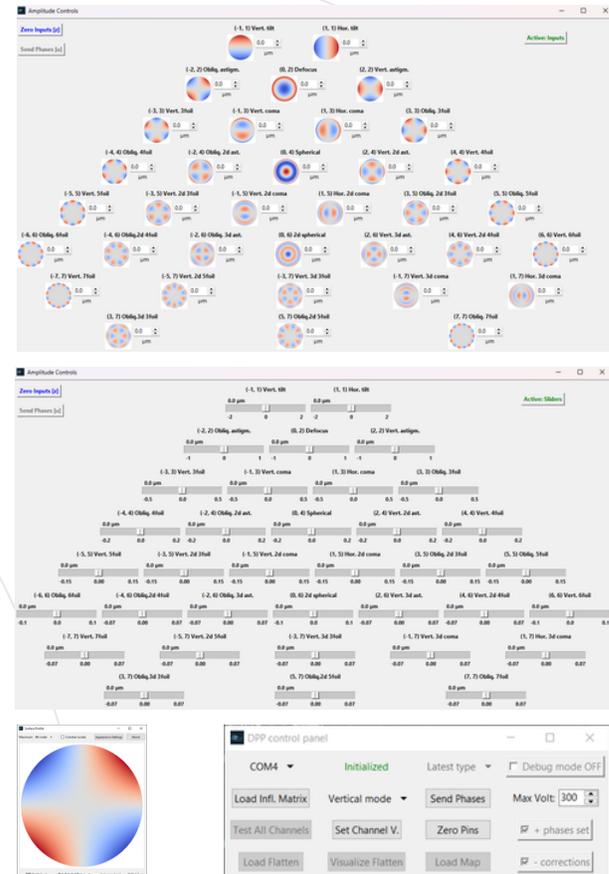
- Python-based interface using serial communication
- Direct application of phase profiles using Zernike polynomial descriptions

Software Development Kit (SDK)

- Python scripting control interface
- MATLAB wrappers to execute Python functions
- Easy integration into custom control software
- Reference implementation of the serial communication protocol included

Phinden (optional add-on for Delta 7)

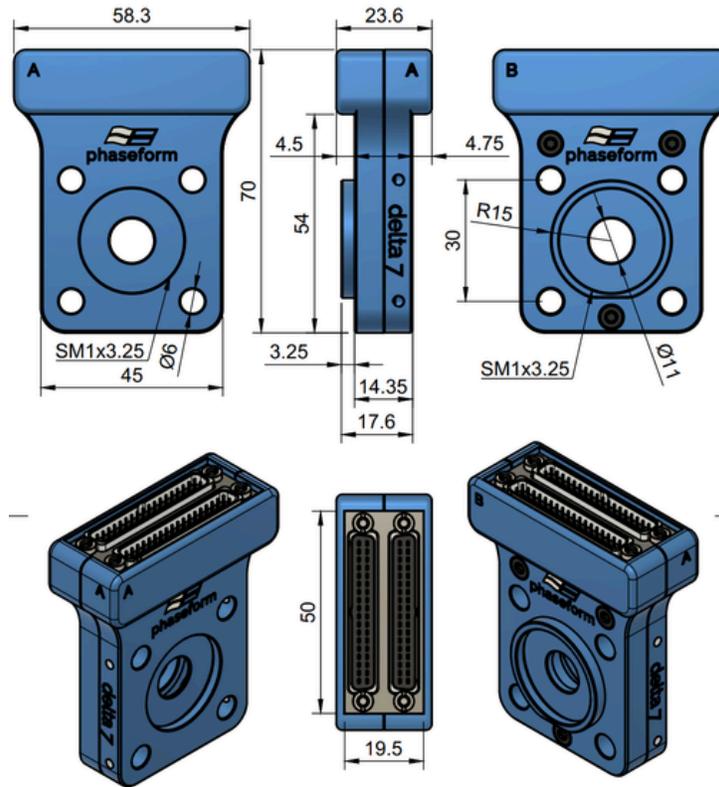
- Turnkey software for real-time, image-based adaptive optics in microscopy
- Automated aberration correction improving resolution, SNR, and contrast
- Runs seamlessly alongside native microscope control software



System Requirements

Operating system: Windows, Linux, macOS
 Python: Minimum version 3.8, recommended - 3.11
 MATLAB: Minimum version R2020b

OPTICS HOUSING MECHANICAL DRAWINGS



DISCLAIMER

All specifications are preliminary and subject to change without notice. No representation or warranty, either expressed or implied, is made as to the reliability, completeness, or accuracy of this specification sheet.

CONTACT US

Get in touch with us today for a live demo!

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