LASER COMPONENTS®

mu-DM

Deformable mirror
The High-end

High dynamic range, linearity & stability
Embedded electronics
High actuator density

imagine optic

mu-DM DATASHEET 2407

06/25 / V1 / CH-IF / imagine-optic/deformable-mirror-mu-dm

mu-DM

Boost your imaging performance : Adaptive Optics made easy and efficient.

APPLICATIONS

+ **Ophthalmology :** Explore retinal cells at high resolution (contact our sister company Imagine Eyes for more informations)
+ **Microscopy :** Image deeper in your sample and/or navigate in 3D (for more details visit mu-Imagine website, our division dedicated to microscopy)
+ **Laser processing**
+ **Astronomy**
+ **Quantum**

FEATURES

+ **Fast closed-loop convergence and accurate sensorless correction** with perfect linearity and absence of hysteresis
+ **Preserved photon budget** with achromatic, highly reflective and continuous membrane
+ **Long-term stability** with temporal drift automatic compensation
+ **Large dynamic range** with 50% of actuators stroke still available while generating 40 microns PtV of focus
+ **Fine timing control** with trigger-in and trigger-out features
+ **Easy integration** with electronics embedded in a single-piece design and connection via a USB3 cable
+ **Correction up to 10th Zernike order** thanks to optimized actuator layout

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/ United Kingdom LASER COMPONENTS (UK) Ltd. Tel +44 1245 491 499 info@lasercomponents.co.uk www.lasercomponents.co.uk

SPECIFICATIONS*

OPTICAL SPECS

Surface quality	7 nm RMS (Optional : down to 4 nm RMS)
Coating	Protected silver
Linearity	> 99.5%
Hysteresis	< 0.1%

OPERATING SPECS

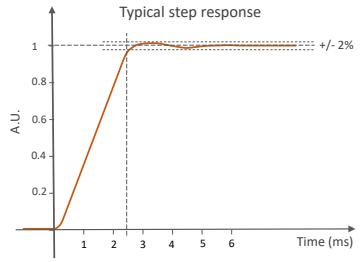
Number of actuators	91
Maximum generated wavefront (PV)	
- 1 actuator	> 10 µm
- 7 actuators	> 50 µm
Effective diameter	15 mm
Spatial frequency correction	Zernike orders up to 10
Rise time	2.4 ms
Max frequency	Typically 300 Hz
Temporal stability	< 15 nm RMS over 12h

MISC

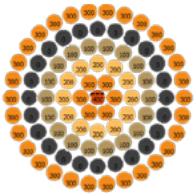
Dimension / Weight	93.8 x 98.3 x 67.2 mm³ / 185 g
Working temperature	19-25°C
Interface / Power consumption	USB 3.0 / 30 W

OPERATING SYSTEM Windows 10

*Subject to changes without further notice

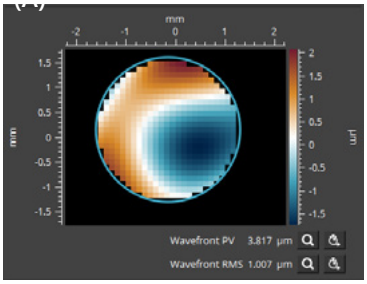


Optimized temporal control achieves a settling time of 2.4 ms with minimal over-shoot (< ±2%)

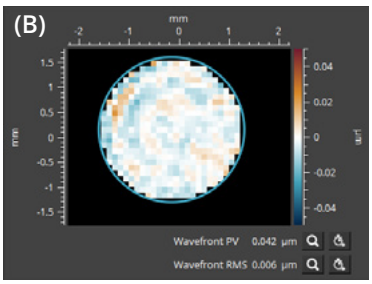


Centro-symmetrical layout is ideal to generate Zernike polynomials in closed-loop and open-loop

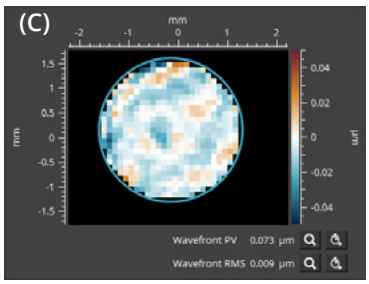
High linearity leads to a remarkable behavior as you can see below :
(A) Input wavefront (B) Results in closed-loop (C) Results in open-loop



Target wavefront is 1.007 µm RMS (combination of Zernike polynomials up to the 4th order)

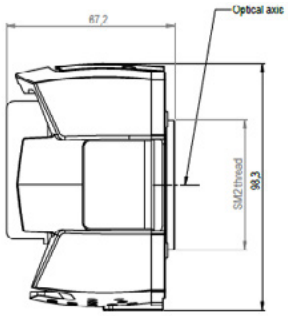


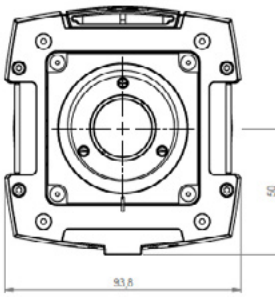
Wavefront error in closed-loop
WFE = 6 nm RMS



Wavefront error in open-loop
WFE = 9 nm RMS

DIMENSIONS (mm)





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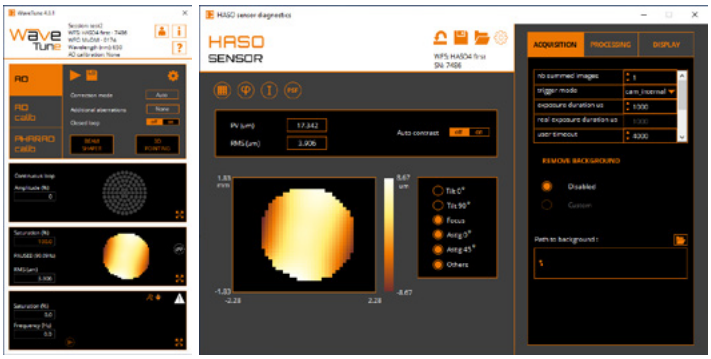
SOFTWARE

WAVETUNE

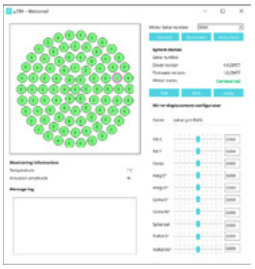
WAVETUNE is a unique software that seamlessly combines wavefront measurement and correction features with extensive instrument diagnostics.

This software contains all the necessary tools to calibrate the Deformable Mirror (DM).
It can also operate the DM in closed-loop with HASO wavefront sensor, as well as in open-loop and perform beam shaping.



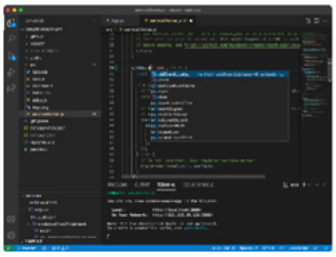
mu-DM Suite

mu-DM Suite is a free software delivered with every mu-DM.
It does not require calibration of deformable mirror with a wave-front sensor but with it you can apply a flat shape or first Zernike modes which can be handy for a first, quick alignment of the de-formable mirror.



WAVEKIT BIO

WAVEKIT BIO is a Software Development Kit (SDK), available in C++ and Python, specifically designed for microscopy applications.
In particular, it contains all the necessary functions to implement sensorless AO, using image-based iterative algorithms (e.g. 3N).



MOUNTING & ACCESSORIES

Several mounting options are available, including adaptors for the most common mechanical stages, to simplify integration of mu-DM into an optical setup.

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