

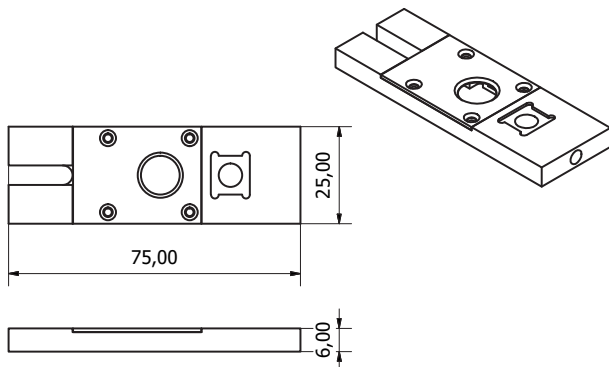
## Introduction

The Argo-POWER<sup>HM</sup> is specifically designed to assess and follow the performances of fluorescence-based imaging systems, such as wide-field, confocal, spinning disk and other types of microscopes, with high magnification (HM) objectives.

This product is composed of a calibrated optical power meter, an Argo-HM patterned glass and Daybook, their companion image analysis software.

The calibrated optical power meter is designed to measure the optical power of light sources at the sample plane in microscopy setups. The Argo-HM glass is a special glass substrate with different fluorescent patterns embedded inside. Daybook software allows to analyze and extract data (maps, graphs and metrics) from images of the patterns, in order to control significant parameters of your fluorescence imaging system.

## Schematics of the slide



## Technical specifications of the power meter part

<b>Detector type</b>	Silicon photodiode
<b>Active detector area</b>	10 mm diameter
<b>Neutral density filter</b>	Reflective (OD 2)
<b>Input aperture</b>	9 mm
<b>Wavelength range</b>	350 - 1100 nm
<b>Power range</b>	10 $\mu$ W - 100 mW
<b>Linearity</b>	$\pm 2\%$
<b>Resolution</b>	< 3 $\mu$ W (350 - 400 nm) < 2 $\mu$ W (400 - 460 nm) < 1 $\mu$ W (460 - 1100 nm)
<b>Calibration uncertainty</b>	$\pm 10\%$ maximum over the whole wavelength range Typically $\pm 2\%$ at 633 nm
<b>Response time</b>	100 ms (minimum), 3 s (to ensure stable reading)
<b>Objective compatibility</b>	Air coupled objectives, with FOV* diameters less than 9 mm

\*FOV : field of view

## Fluorescence stability of patterns

Under normal use (irradiances, either peak or average, no higher than 50 GW/cm<sup>2</sup>), the fluorescence spectrum for a given illumination setting is identical in shape and intensity to any similar part of the patterns.

Under specific illumination configurations, the intensity of the patterns may decrease. However, this decrease is transient. The fluorescence intensity recovers to its initial value after some time. The recovery time depends on the irradiation conditions (power density, wavelength, pixel size, exposure time).

This behaviour is reproducible. For a given intensity and exposure time, the rate of decrease and recovery time will always be the same.

Read the full study at [www.argolight.com](http://www.argolight.com).

## Fluorescence properties of patterns

Patterns are excitable from 350 nm to 650 nm. The emission is a broad continuum and the efficiency decreases as the excitation wavelength shifts towards the red.

## Patterns compatibility

### Imaging compatibility

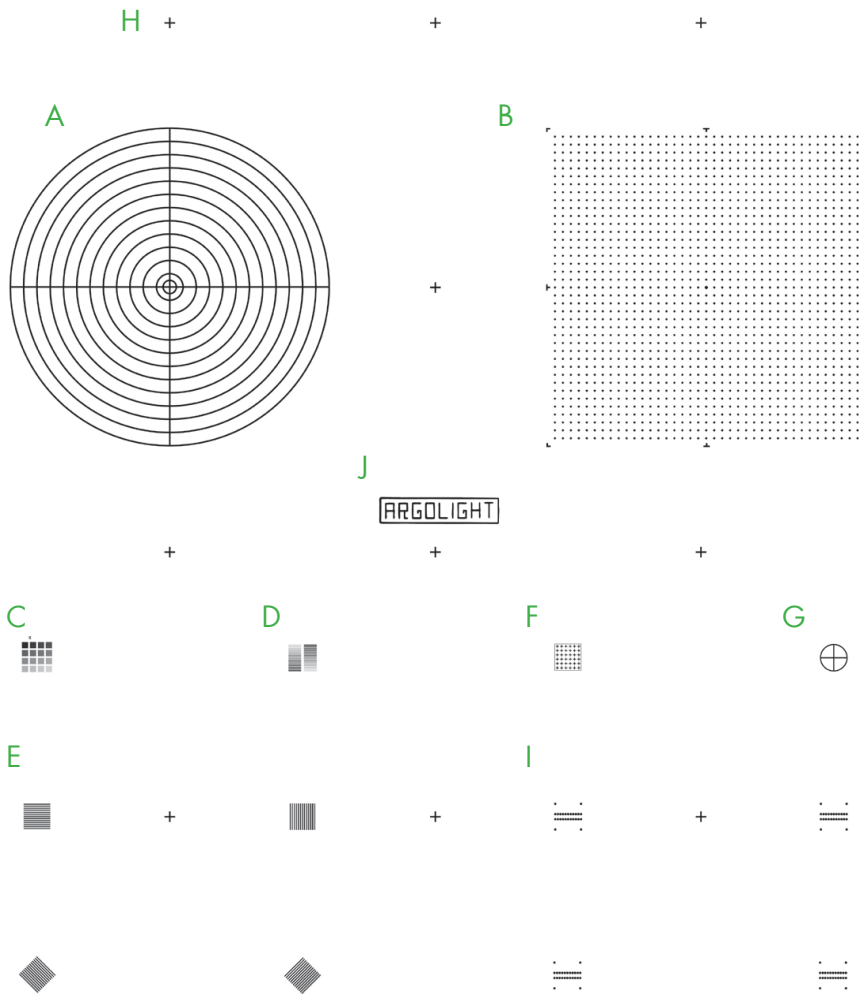
Compatible	Not compatible but not damaging	Not compatible and damaging
Widefield Microscopy Confocal Microscopy Structured Illumination Microscopy FLIM Spinning Disk Microscopy	PALM STORM FRAP FRET Any imaging technology using depletion or multiple dyes.	STED Multiphoton Microscopy Any imaging technology using ultrashort pulsed laser

### Objective compatibility

The glass part is compatible with dry and oil immersion objectives. Water immersion is possible, but continuous exposure longer than five minutes should be avoided.

The optical power meter is only compatible with dry objectives.

## Patterns overview



## Patterns position inside the glass

Patterns are positioned  $(170 \pm 5) \mu\text{m}$  below the top glass surface, on a horizontal plane which flatness is within  $\pm 5 \text{ mrad}$ .

This emulates the presence of a microscope coverglass, having a thickness of  $(170 \pm 5) \mu\text{m}$  and a refractive index of  $(1.5255 \pm 0.0015)$  at 546.1 nm.

The maximum relative positioning error is  $\pm 110 \text{ nm}$  in XY and  $\pm 110 \text{ nm}$  in Z within each individual pattern.

The thickness (in the Z direction) of these patterns is about  $(600 \pm 200) \text{ nm}$  FWHM (Full Width at Half Maximum).

## Patterns description

The slide contains 10 types of patterns.

**Pattern A - Target.** This pattern consists in concentric circles with increasing radii from  $25 \mu\text{m}$  to  $300 \mu\text{m}$  with a step of  $25 \mu\text{m}$ , plus an extra circle with a radius of  $12.5 \mu\text{m}$ , featuring a target.

**Pattern B - Field of rings.** This pattern consists in a matrix of  $39 \times 39$  rings, separated by  $15 \mu\text{m}$ , on a total field of  $600 \times 600 \mu\text{m}^2$ . The field of rings is surrounded by eight landmarks, and exhibits a  $7.5 \mu\text{m}$  long cross in its center.

**Pattern C - 4x4 Intensity.** This pattern consists in sixteen  $8.5 \mu\text{m}$ -wide squares having different fluorescence intensity levels following a linear evolution, organized in a  $4 \times 4$  matrix.

**Pattern D - 2x16 Intensity** This pattern consists in twice sixteen  $22.5 \mu\text{m} \times 1.5 \mu\text{m}$  rectangles having different fluorescence intensity levels following a linear evolution, organized in a  $2 \times 16$  matrix

**Pattern E - Gradually spaced lines.** This pattern consists in pairs of  $50 \mu\text{m}$ -long lines which spacing gradually increases, from  $100$  to  $700 \text{ nm}$ , with a step of  $50 \text{ nm}$ . Four sets of lines are present: One vertical, one horizontal, and two oriented at  $+ \text{ and } - 45^\circ$ .

**Pattern F - Matrix of crosses.** This pattern consists in a matrix of  $6 \times 6$  crosses, having a length of  $5 \mu\text{m}$  and separated by  $8 \mu\text{m}$ , surrounded by a frame. The crosses are composed of vertical lines that are in the same plane, and by horizontal lines, going gradually deeper within the glass. The spacing between the vertical and horizontal lines gradually increases, from  $0$  to  $3.5 \mu\text{m}$ , with a step of  $100 \text{ nm}$ .

**Pattern G - Meridians of a sphere.** This pattern consists in three circles of diameter  $50 \mu\text{m}$  in different orthogonal planes, featuring the meridians of a sphere.

**Pattern H - Repositioning crosses.** The repositioning crosses are  $20 \mu\text{m}$  long and are positioned  $500 \mu\text{m}$  from one to another in the X direction, the Y direction, or both.

**Pattern I - 3D Crossing stairs.** This pattern consists in empty cylinders embedded at different depths, like two crossing stairs, surrounded by four pillars.

There are four stairs in the slide, with varying steps:  $1, 0.75, 0.5$  and  $0.25 \mu\text{m}$ .

**Pattern J - Logo.** This pattern consists in letters forming the company name "Argolight", and surrounded by a  $220 \mu\text{m} \times 50 \mu\text{m}$  frame.