

HiCAM

Intensified High-Speed Camera



The HiCAM is an integrated camera system that was designed for high-speed imaging in low-light conditions. It features a 1.3 megapixel image sensor that captures detailed images at high frame rates of up to 500 fps at full resolution. Reducing the resolution allows for even higher framerates.

A high-quality image intensifier boosts light levels, which offers a unique combination of exposed high-speed recordings in low-light conditions. The dual-stage image intensifier can be equipped with a variety of photocathodes; ranging from ultraviolet to infrared. And because the image intensifier is fiber-optically coupled, the signal-to-noise ratio of the camera is far superior to a lens-coupled system.

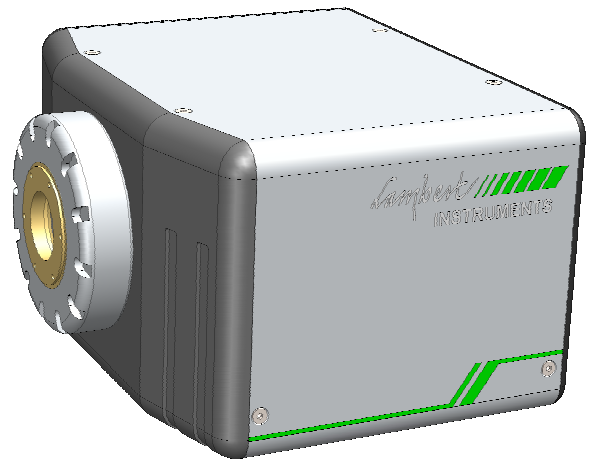
With gating, the image intensifier is used as an ultra high speed shutter, reducing the effective exposure time. This enables time-resolved filtering and also eliminates motion blur. The fan-less design of the camera minimizes vibrations to ensure sharp images.

Data can either be temporarily stored in the built-in memory of the HiCAM 500 or streamed directly to a frame grabber by the HiCAM 500S. Camera control and data download is done over a gigabit ethernet connection using the bundled software. Intensifier gain and gating are also configurable from the software.

HiCAM 15001A02 16/03/2015



HiCAM



HiCAM S

KEY FEATURES

High resolution image intensifiers

Gen II and Gen III image intensifiers offering the world's highest resolution and sensitivity in the UV, visible or near infrared.

Small gate widths

Down to 40 ns (FWHM) with minimal jitter.

High gate repetition rates

Up to 100 kHz.

Compact design

For an easy fit to your imaging or spectroscopy setup.

APPLICATIONS

Combustion research

Plasma physics

Time-resolved fluorescence

Dynamic phenomena in microscopy

Laser Induced Fluorescence (LIF)

Particle Image Velocimetry (PIV)

Micro-fluidics

Blood-flow analysis

CAMERA SPECIFICATION

| | | | |
|-----------------------------|-----------------------|-----------|-----------|
| Maximum resolution (pixels) | 1280 x 1024 | | |
| Resolution (pixels) | 1280 x 1024 | 800 x 600 | 512 x 512 |
| Frame rate (fps) | 500 | 1200 | 2000 |
| Internal memory options | 8 or 16 GB | | |
| Pixel size | 14 x 14 μm | | |
| Computer interface | Gigabit ethernet | | |
| SDK and LabView driver | Optional | | |
| ADC resolution | 8 or 10 bit | | |

GATING PROPERTIES

| | | | |
|--|---------------|----------------|---------------|
| Gain Control | ✓ | | |
| Gate control | ✓ | | |
| Shutter control | ✓ | | Optional |
| Gating pulse width range | 40 ns – 2.5 s | < 3 ns – 10 s | 10 ns – 2.5 s |
| Resulting min pulse width (increments) | 40 ns (10 ns) | < 3 ns (10 ps) | 10 ns (10 ns) |
| Pulse repetition rate | 100 kHz | 300 kHz | 300 kHz |

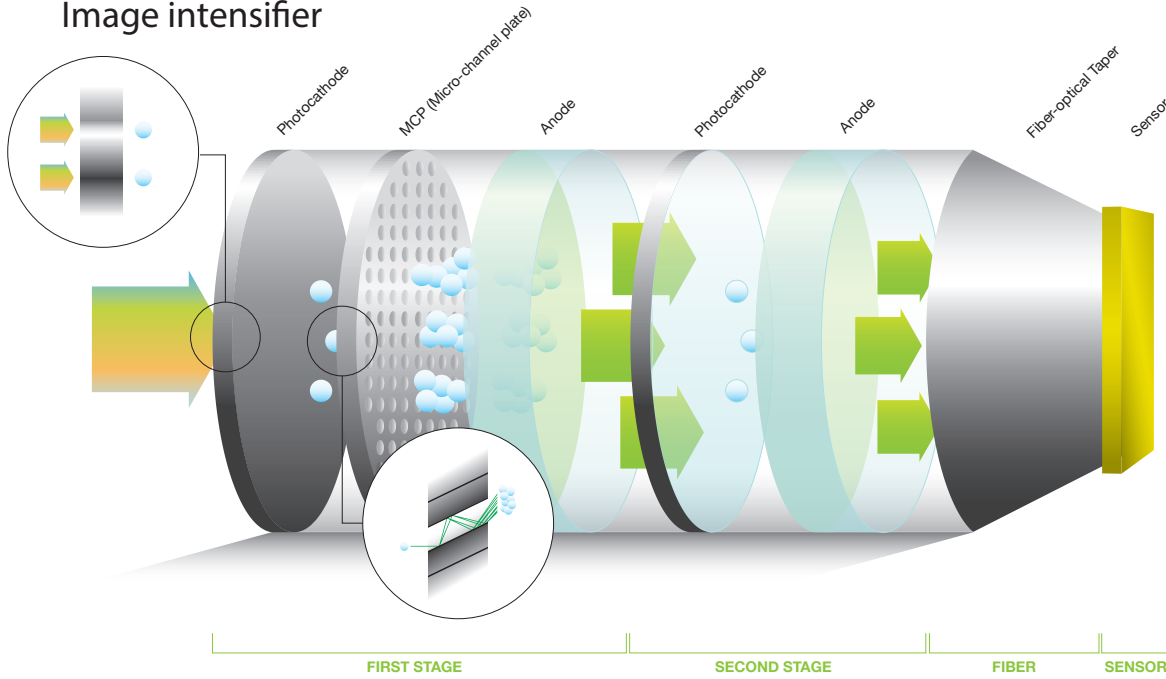
IMAGE INTENSIFIER PROPERTIES

| First stage | S20 | S25 | GaAs | GaAsP |
|--|------------------------------------|--|--|---|
| Max. response wavelength (nm) | 270–450 | 500–850 | 450–550 | 550–750 |
| Full spectral range (nm) | 200–800 | 200–900 | 350–900 | 300–750 |
| Luminous sensitivity ($\mu\text{A}/\text{lm}$) | Min. 150 Typ. 175 | 500 700 | 400 800 | 1000 1200 |
| Gain | Min. 1500 ph/ph Typ. 2200 ph/ph | 2000 $\text{cd}/\text{m}^2/\text{lx}$ 5000 $\text{cd}/\text{m}^2/\text{lx}$ | 3000 $\text{lm}/\text{m}^2/\text{lx}$ 7500 $\text{lm}/\text{m}^2/\text{lx}$ | 3600 $\text{lm}/\text{m}^2/\text{lx}$ 11000 $\text{lm}/\text{m}^2/\text{lx}$ |
| Peak quantum efficiency (%) | Min. Typ. 20 | 17 | 35 50 | 27 |
| Resolution (lp/mm) | Min. 45 Typ. 56 | 45 56 | 45 57 | 40 50 |
| EBI (μlx) | Typ. 0.1 Max. 0.25 | 0.1 0.25 | 0.03 0.3 | 0.03 0.3 |
| Input window | Quartz | Quartz | Borosilicate glass | Borosilicate glass |

| | 18 mm intensifier | 25 mm intensifier |
|-------------------------|-------------------|-------------------|
| Effective area on input | 12.78 x 12.68 mm | 17.75 x 17.61 mm |
| Input window thickness | 5.5 mm | 6.0 mm |

| Second stage | Minimal | Typical |
|---------------------|---------|---------|
| Photon gain (ph/ph) | 6 | 11 |
| Typical total gain | 22000 | 50000 |
| | | 75000 |
| | | 100000 |

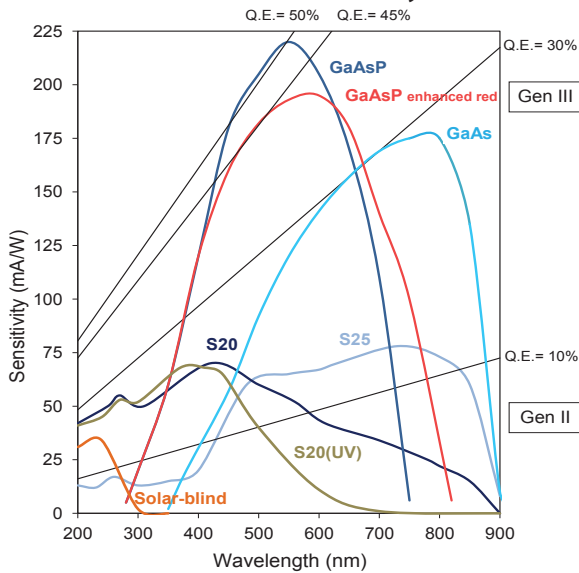
Image intensifier



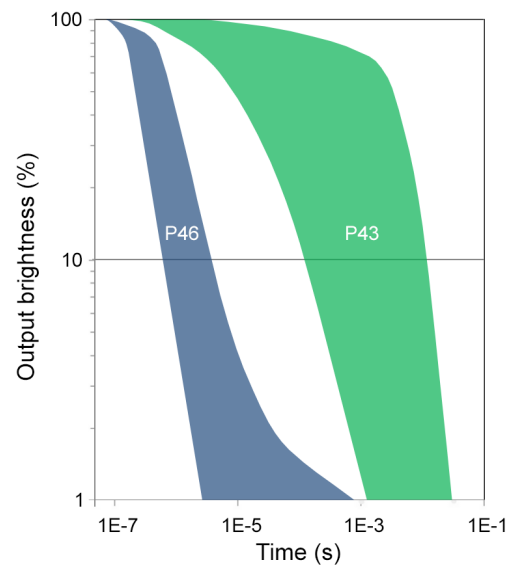
Photons are converted into electrons at the photocathode. These are accelerated towards the micro-channel plate by an electric field and hit the channel walls. Depending on the voltage across the channel, multiple electrons are generated by secondary emission.

This cloud of electrons is accelerated towards the anode screen, where the electrons are converted back into photons by the phosphor layer. The second stage of the intensifier (the booster) further increases the light intensity. Finally, the photons are transferred to the sensor by a fiberoptical taper.

Intensifier sensitivity



Phosphor response time

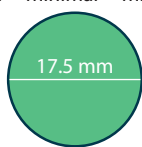
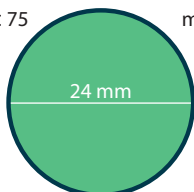


S20 and S25 intensifier quality

The number of dark spots, exceeding a contrast with their surrounding area of 20%, is less than or equal to the number indicated below. The size of non-circular spots is determined on the basis of equal area to circular spots. When the distance between two spots is less than the maximum dimension of either spot, the two spots are considered to be one spot. There shall be no bright spots in the active area.

Maximal number of spots allowed within image area

| Intensifier | Spot size (µm) | Ø6 | Ø6-Ø15 | Ø15 - edge |
|-------------------|----------------|---------|---------|------------|
| 18 mm intensifier | Spot size (µm) | -Ø6 | Ø6-Ø15 | Ø15 - edge |
| 25 mm intensifier | Spot size (µm) | -Ø8 | Ø8-Ø20 | Ø20 - edge |
| | > 300 | 0 | 0 | 0 |
| | 225 - 300 | 0 | 0 | 1 |
| | 150 - 225 | 0 | 1 | 2 |
| | 75 - 150 | 1 | 2 | 3 |
| | < 75 | minimal | minimal | minimal |



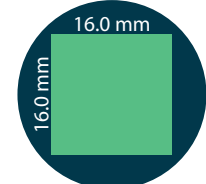
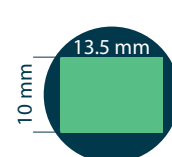
Guarantee area: 25 mm intensifier 18 mm intensifier

GaAs and GaAsP intensifier quality

The dark and white spots which exceed a contrast of 30 percent of their surrounding area should not exceed the following values over the guarantee area. Spot size is defined as the diameter of the circle, with an area equal to the area of the spot. N/A denotes 'Not applicable' in the table below.

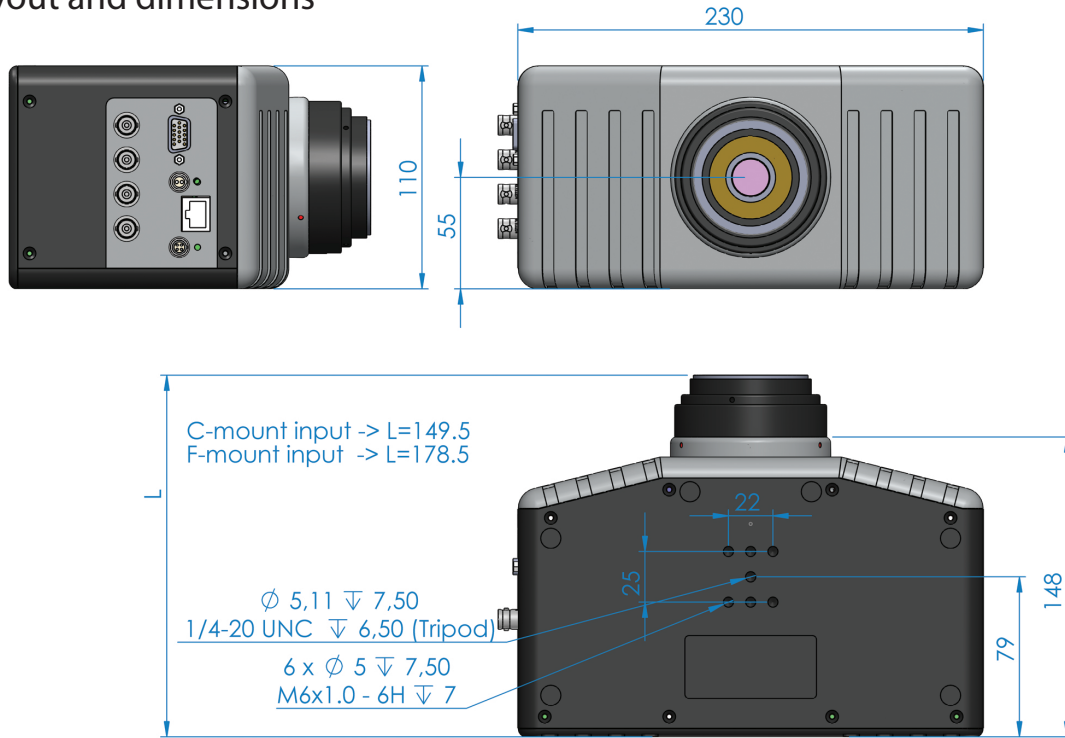
Number of spots allowed: 18 mm (25 mm) intensifier

| Size X (µm) | Dark spots | Size X (µm) | White spots |
|---------------|------------|--------------|-------------|
| X > 150 | 0 (0) | X > 100 | 0 (0) |
| 100 < X ≤ 150 | 2 (4) | 75 < X ≤ 100 | 4 (8) |
| 75 < X ≤ 100 | 8 (15) | 50 < X ≤ 75 | 6 (11) |
| X ≤ 75 | N/A (N/A) | X ≤ 50 | N/A (N/A) |



Guarantee area: 18 mm intensifier 25 mm intensifier

HiCAM layout and dimensions



HiCAM S layout and dimensions

