



ORCA®-Flash4.0 V3

We've advanced our camera technology,
so you can advance your science

Building on our extensive experience with high performance scientific cameras and advanced imaging applications, Hamamatsu introduces the new ORCA-Flash4.0 V3. This one camera expertly handles applications ranging from the acquisition of beautiful scientific images to experiments that demand detection, quantification and speed. With on-board FPGA processing enabling intelligent data reduction, highly refined in-camera, pixel-level calibrations, increased USB 3.0 frame rates, purposeful and innovative triggering capabilities, patented lightsheet read out modes and individual camera noise characterization the ORCA-Flash4.0 V3 is the precision instrument for imaging.

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Calibrated for Quantitative Accuracy

Our ORCA-Flash4.0 cameras have always provided the advantage of low camera noise. In quantitative applications, like single molecule imaging and super resolution microscopy imaging, fully understanding camera noise is also important. Every ORCA-Flash4.0 V3 is carefully calibrated... as a precision instrument must be. Our attention to this detail delivers outstanding linearity, especially at low light, and offers improved photo response non-uniformity (PRNU) and dark signal non-uniformity (DSNU) to minimize pixel differences and reduce fixed pattern noise. Each camera ships with a certificate providing the read noise and photoelectron conversion factor specific for that camera.

Flexibility for Customized Data Control

Like its predecessors, each ORCA-Flash4.0 V3 is capable of both USB 3.0 or Camera Link output. In addition, the ORCA-Flash4.0 V3 offers data reduction through user-controllable look up tables (LUT) for 12 or 8-bit output. These two choices, combined with region of interest selection enable you to fine tune acquisition speed and image data requirements.



Each ORCA-Flash4.0 V3 is shipped with a mounting baseplate pre-installed.

| Region of Interest ¹ | Output Bit Depth | Camera Link frames per second ² | USB 3.0 frames per second ² |
|---------------------------------|------------------|---|---|
| 2048 x 2048 | 16 | 100 | 40 |
| | 12 | 100 | 53 |
| | 8 | 100 | 80 |
| 2048 x 1024 | 16 | 200 | 80 |
| | 12 | 200 | 106 |
| | 8 | 200 | 160 |
| 2048 x 512 | 16 | 400 | 160 |
| | 12 | 400 | 212 |
| | 8 | 400 | 320 |
| 2048 x 8 | 16 | 25655 | 9329 |
| | 12 | 25655 | 12827 |
| | 8 | 25655 | 17103 |

¹ Pixels centered on chip, horizontal x vertical ² In standard scan mode

Patented Tools for Advanced Imaging

The ORCA-Flash4.0 V3 includes our now patented, Lightsheet Readout Mode which takes advantage of sCMOS rolling shutter readout to enhance the quality of lightsheet images.

When paired with our W-VIEW GEMINI image splitting optics, a single ORCA-Flash4.0 V3 camera becomes a powerful dual wavelength imaging device. In "W-VIEW Mode," each half of the sensor can be exposed independently, facilitating balanced dual color imaging with a single camera. And this feature can be combined with the new and patented "Dual Lightsheet Mode" making simultaneous dual wavelength lightsheet microscopy a reality. And finally, the ORCA-Flash4.0 V3 is the perfect complement to our new W-VIEW GEMINI-2C dual camera, super resolution-quality, image splitting optics.

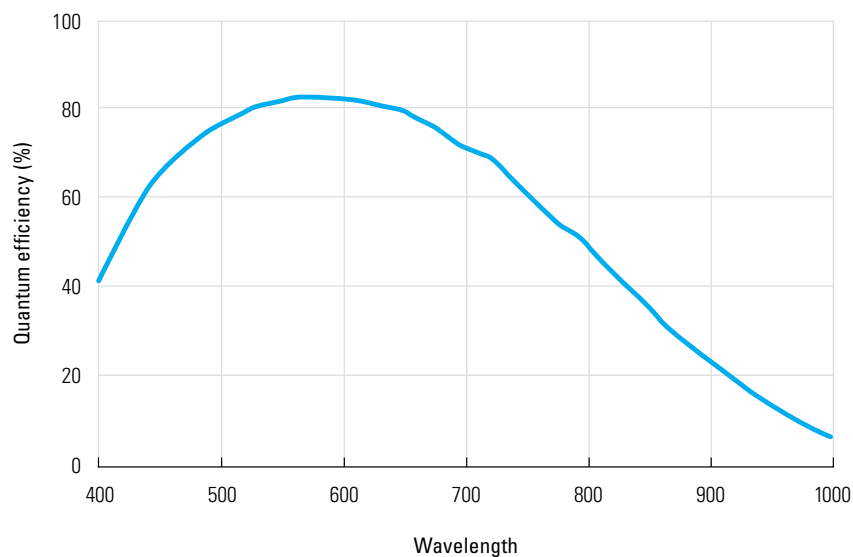
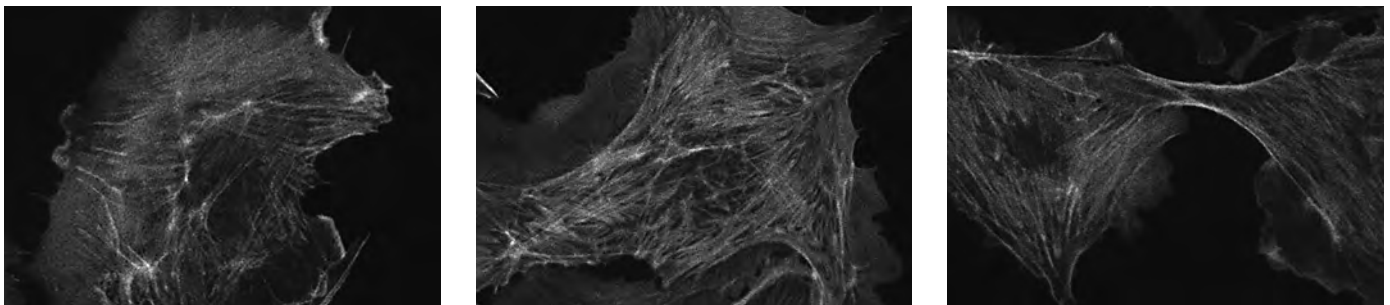
Focus on the Relevant Data

Our new “Enhanced Visualization Mode” was designed to help answer the question “Can I see it?” Many low light experiments, especially those that were previously imaged using EM-CCDs are now routinely accomplished—with better signal to noise, faster speeds and at far less expense—by sCMOS cameras. However, we sometimes miss the visual punchiness of EM-CCD images. Enhanced Visualization Mode pops the contrast of the displayed image, while saving the sCMOS raw image data to disk.

And sometimes our innate tendency to seek contrast can be a distraction. Even a few hot pixels in a time lapse or tracking experiment can divert our attention or our analysis from the real data. Enter our multi-level, user-selectable, hot pixel reduction. By applying a series of increasingly aggressive algorithms to detect noisy pixels, you can choose to eliminate these small but distracting elements. And since nobody appreciates having their data unexpectedly modified, the default setting for this hot pixel correction is off when you power up the camera.

Powerful Triggering for Synchronization

Joining a full complement of sophisticated triggering routines, our new Master Pulse timing generator allows the ORCA-Flash4.0 V3 to truly run the experiment. Performing functions that previously would have required an external pulse generator the ORCA-Flash4.0 V3’s Master Pulse has flexible timing delays built in. Powerful synchronization of multiple cameras and devices just became a lot simpler.



Specifications

ORCA-Flash4.0 V3

| | | |
|---|---|----------------------|
| Product Number | C13440-20CU | |
| Imaging Device | sCMOS | |
| Cell (pixel) Size (μm^2) | 6.5 | |
| Pixel Array (horizontal by vertical) | 2048 x 2048 | |
| Effective Area (horizontal by vertical in mm) | 13.312 x 13.312 | |
| Peak Quantum Efficiency (QE) | 82 % @ 560 nm | |
| Dynamic Range ¹ | 37 000 | |
| Readout Noise (N°) median in electrons slow scan ¹ | 0.8 @ 30 fps | 0.8 @ 30 fps |
| Readout Noise (N°) rms in electrons slow scan ¹ | 1.4 @ 30 fps | 1.4 @ 30 fps |
| Readout Noise (N°) median in electrons standard scan ¹ | 1.0 @ 40 fps | 1.0 @ 100 fps |
| Readout Noise (N°) rms in electrons standard scan ¹ | 1.6 @ 40 fps | 1.6 @ 100 fps |
| Maximum Full Resolution Frame Rate (fps) | 40 | 100 |
| Cooling Temperature Readout | Yes | |
| Dark Current (electrons/pixel/s) – Air Cooled to -10° C | 0.06 | |
| Dark Current (electrons/pixel/s) – Water Cooled to -10° C | 0.06 | |
| Dark Current (electrons/pixel/s) – Water Cooled to -30° C | 0.006 | |
| Full Well Capacity in electrons ¹ | 30 000 | |
| Digital Outputs (with programmable LUT) | 16, 12, 8 bits | |
| Readout Modes | Normal Area, Lightsheet, W-VIEW Mode, Dual Lightsheet | |
| Binning | 2 x 2 / 4 x 4 | |
| Master Pulse Generator (Pulse Modes) | Internal Sync, Start Trigger, Burst | |
| Master Pulse Generator (Pulse Interval in 1 μs increments) | 10 μs to 10 s | |
| Hot Pixel Correction | Off, Low, Medium, High | |
| Dark Signal Non-Uniformity (DSNU) ¹ | 0.3 e- rms | |
| Photo Response Non-Uniformity (PRNU) at half level of full light range (15,000 electrons) ¹ | 0.06 % rms | |
| Photo Response Non-Uniformity (PRNU) at low light level (700 electrons) ¹ | 0.3 % rms | |
| Linearity error, full light range (EMVA 1288 standard) ¹ | 0.5 % | |
| Linearity error, low light range (< 500 electrons signal) ¹ | 0.2 % / Less than approx. 1 e- absolute error | |
| On-camera Connectivity | Both USB 3.0 and Camera Link ² | |
| V2 Compatibility Mode (for use with legacy software) | Yes | |
| Lens Mount | C-mount | |

¹ Typical value ² Enabled with optional Camera Link board for PC

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