



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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PHOTON IS OUR BUSINESS

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.

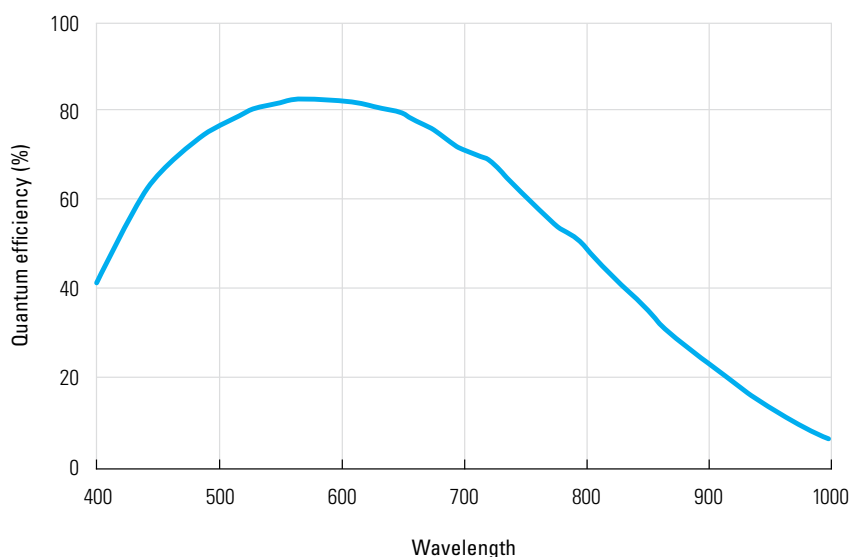
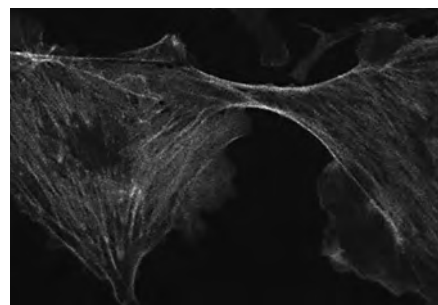
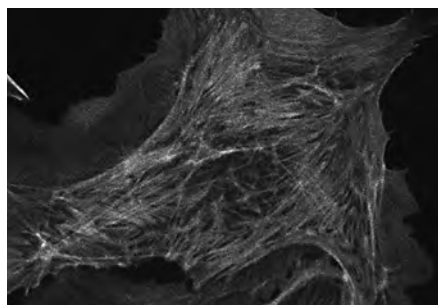
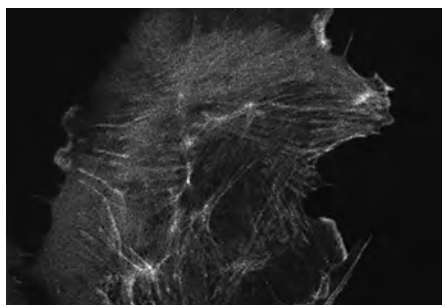
Focus on the Relevant Data

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



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ORCA-Flash4.0 V3

Product Number
Imaging Device
Cell (pixel) Size (μm^2)
Pixel Array (horizontal by vertical)
Effective Area (horizontal by vertical in mm)

C13440-20CU
sCMOS
6.5
2048 x 2048
13.312 x 13.312

Peak Quantum Efficiency (QE)
Dynamic Range¹

82 % @ 560 nm
37 000

Readout Noise (N_r) median in electrons slow scan¹
Readout Noise (N_r) rms in electrons slow scan¹
Readout Noise (N_r) median in electrons standard scan¹
Readout Noise (N_r) rms in electrons standard scan¹
Maximum Full Resolution Frame Rate (fps)

USB 3.0	With Optional Camera Link Board for PC
0.8 @ 30 fps	0.8 @ 30 fps
1.4 @ 30 fps	1.4 @ 30 fps
1.0 @ 40 fps	1.0 @ 100 fps
1.6 @ 40 fps	1.6 @ 100 fps
40	100

Cooling Temperature Readout
Dark Current (electrons/pixel/s) – **Air Cooled to -10° C**
Dark Current (electrons/pixel/s) – **Water Cooled to -10° C**
Dark Current (electrons/pixel/s) – **Water Cooled to -30° C**
Full Well Capacity in electrons¹

Yes
0.06
0.06
0.006
30 000

Digital Outputs (with programmable LUT)
Readout Modes

16, 12, 8 bits
Normal Area, Lightsheet, W-VIEW Mode, Dual Lightsheet

Binning

2 x 2 / 4 x 4

Master Pulse Generator (Pulse Modes)
Master Pulse Generator (Pulse Interval in 1 μs increments)

Internal Sync, Start Trigger, Burst
10 μs to 10 s

Hot Pixel Correction
Dark Signal Non-Uniformity (DSNU)¹
Photo Response Non-Uniformity (PRNU) at half level of full light range (15,000 electrons)¹
Photo Response Non-Uniformity (PRNU) at low light level (700 electrons)¹
Linearity error, full light range (EMVA 1288 standard)¹
Linearity error, low light range (< 500 electrons signal)¹

Off, Low, Medium, High
0.3 e- rms
0.06 % rms
0.3 % rms
0.5 %
0.2 % / Less than approx. 1 e- absolute error

On-camera Connectivity
V2 Compatibility Mode (for use with legacy software)
Lens Mount

Both USB 3.0 and Camera Link²
Yes
C-mount

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

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