



*ORIGIN*TM

DESIGNED FOR CINEMATOGRAPHERS



origin

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[origin: n. 1 a new beginning for digital cinematography.]

Digital has been acknowledged as the future of moviemaking. But until now, it has also been acknowledged as “not good enough” to be a serious alternative to traditional film cameras.

Despite impressive technology advances, most digital motion picture cameras are still based squarely on television standards of resolution, lensing, and creative control. “HD” has not begun to draw on film’s 100 years of progress in the technology of visual art. No wonder it “doesn’t look like film.”

Nobody has ever designed a digital camera from the ground up for cinematography...Until now.

DALSA is proud to introduce Origin™, the world’s first digital cinematography camera. Working closely with a group of industry veterans who truly understand the needs of the professional cinematographer, DALSA has designed a revolutionary system from the ground up, delivering unprecedented image quality and unrivalled creative control.

Origin is not an “HD” camera. Its design and its realization go far beyond HD. Here are a few reasons why.

- **Cinematography design:** Origin has not grown from videocam roots. Its revolutionary power and performance have been focused directly at the needs of moviemaking.
- **Film-sized sensor:** 4k x 2k resolution—four times more than HD. Not only does it capture more detail, it captures better detail—its 14-bit dynamic range and tunable, film-like response means no crushed blacks and no washed-out highlights.
- **Real cinema lenses:** 35mm PL mount cinema lenses. Origin’s large sensor allows you to get the depth of field you expect and achieve the effects you’ve spent years honing with the lenses you know and trust.
- **Optical viewing system:** See what you’re actually shooting—and how you’re shooting it—with our integrated optical viewer.
- **Next generation performance, present-generation compatibility:** Origin represents the next generation of digital cinematography. But it still integrates with existing digital workflows.

ORIGIN'S ORIGIN: where the beginning began

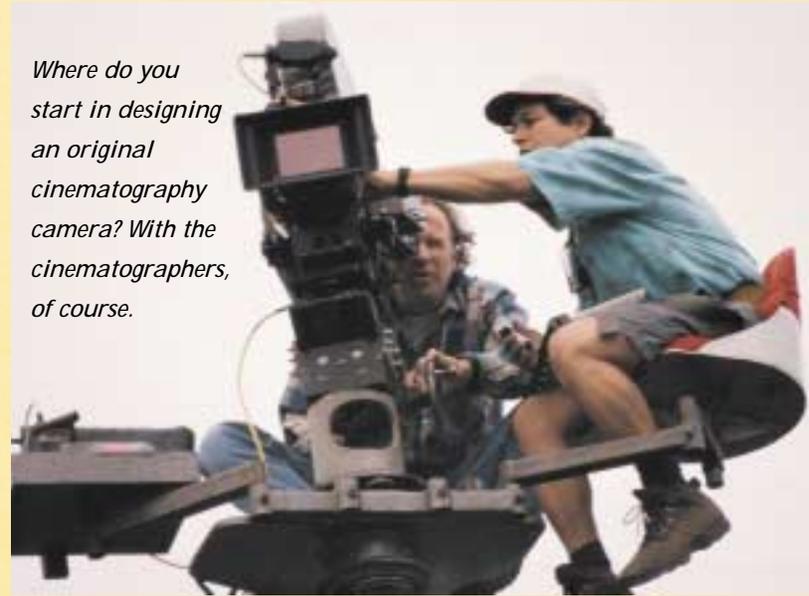
DALSA has been developing the world's highest-performance image sensors and cameras for over 20 years, serving scientific and industrial applications that demanded ultra-high resolution (50+ megapixels), ultra-high frame rate (up to 1 million frames per second), or ultra-high dynamic range (12, 14, 16 bits and more). While these goals are often difficult to reconcile, DALSA has consistently delivered unrivalled combined performance.

This is why in 1997 Japanese broadcasting giant NHK asked us to work with them on a research project to develop a prototype Ultra-HDTV system. We immediately questioned the artificial restriction of a 2/3" sensor and the limitations of the lenses it requires, and we convinced them that a bigger sensor was the way to go. The sensor was a success, delivering unparalleled resolution, fidelity, frame rate, and dynamic range. NHK's proof-of-concept camera was technically impressive, but it was impractical for real-world use. It was also somewhat ahead of its time—the television world still hasn't fully embraced HDTV, never mind Ultra-HDTV.

However, there **was** an industry hungry for our sensor's performance. A few far-seeing individuals in Hollywood became aware of the sensor and began asking us about its future. They envisioned a digital future but wanted more than HD, in part because HD 1920 x 1080 capture has considerably less spatial resolution than film. Film-equivalent resolution requires capture at least double HD resolution in both dimensions—e.g. 4k x 2k, or four times the total number of pixels of HD. But a 4k x 2k sensor that could deliver 24 or 30 progressive frames per second with the dynamic range to match the exposure latitude of film did not exist. Or, rather, it *had* not.

DALSA had proved that we could deliver a true cinema sensor. But could we build a practical camera around it? With 20 years of excellence behind us, we had confidence in our ability to make it work. But what shape should the technology take? How should it behave? We didn't know...but we knew who did.

Where do you start in designing an original cinematography camera? With the cinematographers, of course.



To ensure our camera would truly answer cinematographers' dreams, we went back to those far-seeing Hollywood individuals. Guided by the wish lists, wisdom, and practical experience of industry veterans such as Ed DiGiulio and Denny Clairmont, our best technical minds set out to create a new beginning.

DALSA's Origin represents the evolution of cinematography. But it also respects cinematography's history. Features such as standard cine lenses and the optical viewfinder are "old school" elements that truly allow cinematographers to leverage Origin's impressive performance potential.

[origin: n. **2** unparalleled cinematography performance. **3** four times the resolution of HD. **4** unprecedented image quality.]

To get the big picture you need for the big screen, you need a big sensor—and a clear vision. Origin delivers all of those elements, with imaging performance you've never seen before.

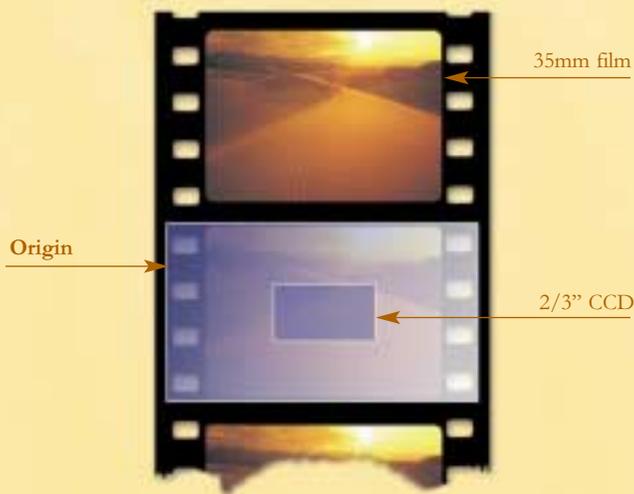
CINEMA SENSOR

Origin's sensor is not only bigger, it's better—the best cinematography sensor in the world. One of the obvious advantages of this large sensor is the increased resolution. Origin's sensor has an optically active resolution of 4046(H) x 2048(V). 8.2 million full pixels. Four times more resolution than HD.

But the size of the sensor gives Origin advantages beyond just resolution. Not only does it have more pixels, each pixel is almost three times as big as a 2/3" format HD pixel. Its bigger pixels have a higher charge capacity and better signal-to-noise ratio. Combined with our superior pixel design, this gives us more dynamic range than any other cinematography sensor, CCD or CMOS. In simple terms, Origin's sensor gives better images.

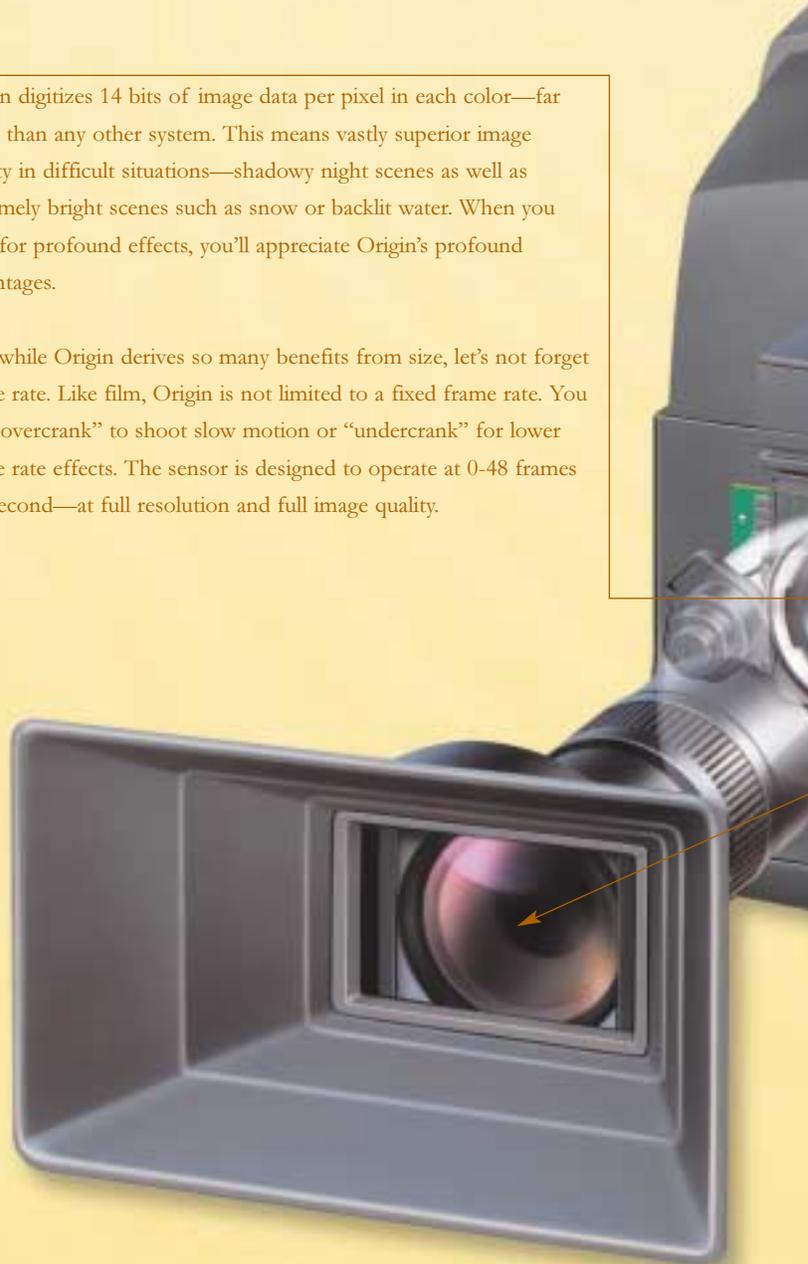
Origin digitizes 14 bits of image data per pixel in each color—far more than any other system. This means vastly superior image quality in difficult situations—shadowy night scenes as well as extremely bright scenes such as snow or backlit water. When you light for profound effects, you'll appreciate Origin's profound advantages.

And while Origin derives so many benefits from size, let's not forget frame rate. Like film, Origin is not limited to a fixed frame rate. You can "overcrank" to shoot slow motion or "undercrank" for lower frame rate effects. The sensor is designed to operate at 0-48 frames per second—at full resolution and full image quality.



Comparison to 35mm Film and 2/3" HD Formats

Origin's sensor has an imaging area slightly larger than film and over 11 times larger than a 2/3" format sensor. Compared to HD, Origin has four times as many pixels, and each pixel is almost three times as big.





OPTICAL VIEWFINDER

Viewfinders are a basic requirement of any type of photography. Film cameras use rotating mirrors to “tap into” the optical path between the lens and the film. Electronic cameras have traditionally used an electronic viewfinder, taking the image right from the sensor without additional optics. It performs the same function, right?

Not quite. An electronic viewfinder is actually a low-resolution projection device which downsamples from millions to thousands of pixels. When that much resolution is discarded, it becomes difficult to judge focus, especially during action. And unlike optical viewers with their ground glass frame lines, electronic viewers cannot show out-of-frame objects and action.

Electronic viewers are comparatively easy to design into a digital camera, and Origin provides HD and DVI outputs for viewers or monitors. But the professionals we consulted all demanded the performance of an optical system. Origin’s viewfinder provides you clarity and precision vital to serious cinematography.

CINEMA LENSES

No matter how you capture your images, the image you get depends on the lenses and filters you use. Specific lenses have specific depths of field and allow specific creative effects. With experience, cinematographers come to play their equipment like instruments. They can use focus like orchestra conductors, leading the eye from point to point within a scene for dramatic (or comic...) effect.

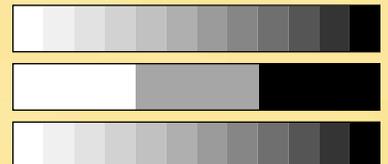
This creative control is generally lost in HD systems, whose 2/3” format lenses tend to put everything in a frame in focus, as well as exhibiting “breathing” and “ramping” behavior very different from most cinema lenses. These are great features for news reporters, but severely limit creative control. That’s why DALSA designed Origin with a PL mount for cinema lenses—to allow cinematographers to “focus” on cinematography while leveraging their experience and familiarity with existing lenses. You can use the lenses you already trust to get the effects you expect.

DYNAMIC RANGE: Origin’s superior sensor allows higher dynamic range output.

Input Range

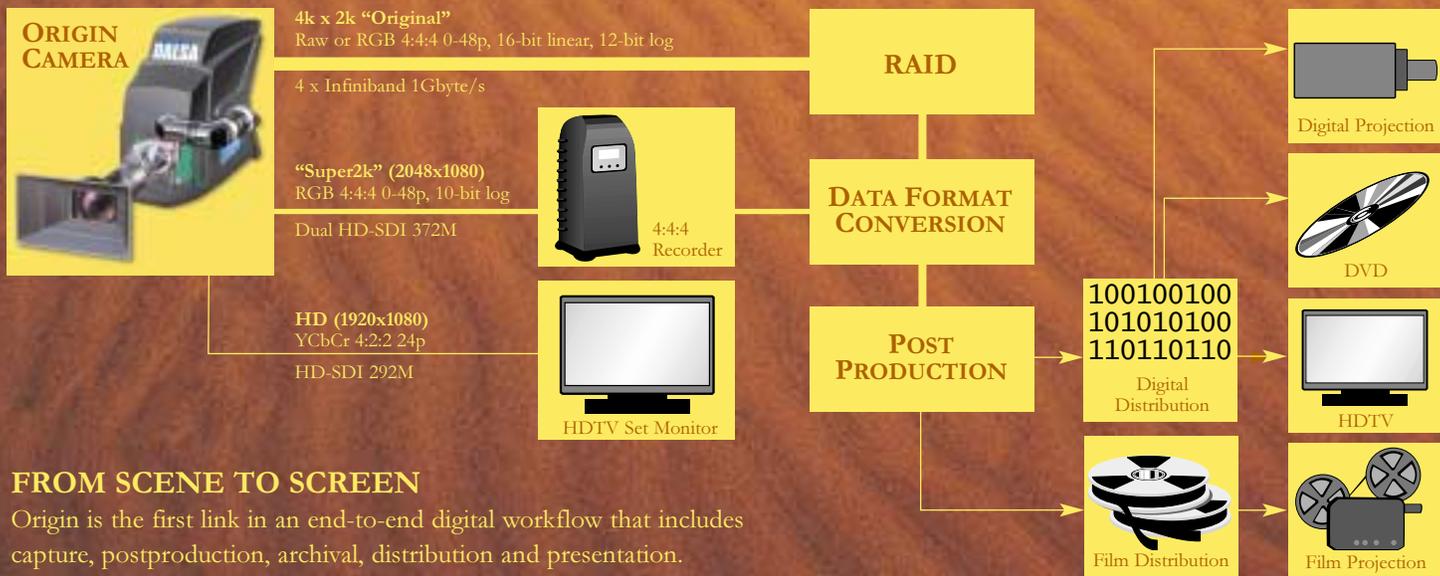
Low Dynamic Range Output
cannot distinguish fine tonal variations

High Dynamic Range Output
distinguishes fine tonal variations



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[origin: n. 5 next generation performance, present generation compatibility.]

The digital moviemaking workflow includes capture, post-production, archival, distribution, and presentation. Origin is just one link in that chain. So while it has been designed for unprecedented performance, it also allows "backwards-compatibility" with the existing digital workflow, from scene to screen.

CAMERA INTERFACE

DALSA has taken care to ensure Origin's technology doesn't overwhelm its users. Origin makes its main photography options simply and easily accessible through a large color touch-screen, putting frame rate, data format, sensitivity and color gamut at your fingertip. You can also snap test frames to the camera's user flash card or other network locations.

More "technical" settings—time code, network address, and others not directly related to the look of the shot you're trying to achieve—can also be configured through the touch screen. And all camera settings can be customized, saved to a compact flash card, and tweaked offline on a computer. This means you can

experiment as much as you want, and once you've found the look (or looks) you want, you can carry them around in your pocket.

ACCESSORIES

It takes more than a camera to shoot a movie. Cinematographers and camera assistants require a variety of accessories to do their jobs—follow focus, lens light, video assist, tape measures, and so on. DALSA listened to the advice of professionals and has made provisions for a variety of hot shoes, "rosette" accessory mounts and auxiliary power points.

BANDWIDTH & STORAGE

Origin's resolution and bit depth require tremendous storage capacity and throughput. In 4k x 2k 4:4:4 16-bit linear mode, Origin produces 1.2Gbytes/s, almost ten times the data volume of a HD 4:4:4 10-bit camera.

Recording this data requires an ultra-high performance RAID hard drive array, with multiple high-speed drives recording in

parallel. Since 1.2Gbyte/s fills a Terabyte in less than 15 minutes, this RAID must be large as well as fast. Fortunately, Origin allows 12- and 10-bit log output and perfectly lossless in-camera compression to reduce both the bandwidth and storage needed.

DALSA's custom recording array has been designed to handle over 1Gbyte/s throughput. Since this storage is both critical and unprecedented, DALSA continues to work with a number of high-performance storage solution providers to offer more and better recording options.

LOSSLESS COMPRESSION

Origin's bandwidth and storage requirements make compression extremely important. But image fidelity is still paramount—the only compression acceptable for digital masters and archival is perfectly lossless compression. Perfectly, mathematically lossless means an image compressed and uncompressed will be bit-identical to the original. DALSA uses a compression algorithm known as L³, for Layered Low-complexity Lossless. L³ provides mathematically lossless compression, and achieves a higher compression ratio (2.5:1) than any other lossless scheme that has

been considered by the MPEG committee, including JPEG 2000, JPEG LS, and any of the existing MPEG standards. The low complexity of the L³ algorithm will also allow real-time hardware implementation (necessary to handle Origin's throughput).

DALSA holds the exclusive commercial license to the use of L³ in the digital cinema industry. Because we believe it can play an important role in the development of a 4k digital workflow, DALSA will develop a reference hardware design for third party L³ implementations.

POSTPRODUCTION

Origin's flexible output options allow the configurations or conversion necessary to take the raw "footage" into postproduction. While Origin's resolution and bit depth are larger than current 2k digital intermediate tools can process in real time, our lossless compression algorithms allow a 2k "proxy" to be edited, with the final edit list applied off-line to the 4k master. Our 4k format not only works for today, it represents an ideal archival-quality master that allows your original vision to move easily to whatever new postproduction or display standards emerge in the years to come.

Origin Output Formats	Color Encoding	Color Space	Mbytes/s ¹
Primary 4K Output (4046 x 2048) Protocol: 4xInfiniband over FiberOptic			
Raw Native, 16 bits per pixel, linear ²	Bayer pattern	—	402
Interpolated RGB, 16 bits per channel (48 total), linear	4:4:4	RGB, film or DLP gamuts	1208 ³
R'G'B', 12 bits per channel (36 total), log	4:4:4	R'G'B', film or DLP gamuts	906
R'G'B', 10 bits per channel (30 total), log	4:4:4	R'G'B', film or DLP gamuts	755
Super 2K Output (2048 x 1080) Protocol: Dual HD-SDI over Copper Cable (SMPTE 372M)			
Interpolated R'G'B', 10 bits per channel (30 total), log ⁴	4:4:4 DPX	R'G'B', film or DLP gamuts	199
HD 2K Output (1920 x 1080) Protocol: HD-SDI over Copper Cable (SMPTE 292M)			
Interpolated YCbCr, 10 bits per channel (20 total), log	4:2:2 DPX	YCbCr, Rec. 709 gamut	125
Notes: 1. Mbytes/s @ 24p, uncompressed, including overhead and metadata. 2. Color interpolation required in post. 3. Exceeds 4xInfiniband bandwidth (1Gbyte/s). Lossless compression required, reducing bandwidth to ~500Mbytes/s. 4. Compatible with any recording device supporting the protocol, such as Director's Friend™.			

[**DALSA: n. 1 world leader in high performance digital imaging.**]

DALSA is an international high performance semiconductor and electronics company that designs, develops, manufactures, and markets digital imaging products and solutions, in addition to providing wafer foundry services. DALSA's core competencies are in specialized integrated circuit and electronics technology, and highly engineered semiconductor wafer processing. Products include image sensor components; electronic digital cameras; and semiconductor wafer foundry services for use in MEMS, power semiconductors, image sensors and mixed signal CMOS chips.

DALSA is a public company listed on the Toronto Stock Exchange under the symbol "DSA". Based in Waterloo, ON, Canada, the company has operations in Bromont, PQ; Colorado Springs, CO; Tucson, AZ; Eindhoven, NL; Munich, Germany and Tokyo, Japan.



DALSA Digital Cinema

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