
AG-DVX200
TECH BRIEF

4/3" Sensor and Fixed Lens

By Barry Green, a producer/writer who has authored many books on the operations of Panasonic professional camcorders.



Why a 4/3” Sensor With A Fixed Lens?

There’s no doubt; Panasonic “zigged” when everyone else has “zagged.” While seemingly the rest of the camcorder manufacturing industry is pursuing large sensors with interchangeable lens capability, Panasonic has produced the DVX200, a camera with a quite large sensor, but with a fixed (non-removable) lens. What benefits are there to this approach?

Traditional Sensor Sizes

In the professional video world, there have been traditionally two main sensor sizes for video cameras and camcorders: the 1/3” sensor, and the 2/3” sensor.

For decades, **2/3” sensor** camcorders have been the mainstay of professional production. 2/3” camcorders are typically large full-size shoulder-mount cameras, mounted with interchangeable power zoom lenses, and are frequently used as studio cameras, for sports coverage, and general-purpose production. The 2/3” sensor size provides excellent imaging capability, dynamic range, sensitivity, and even the ability to create relatively shallow depth of field.



1/3” sensors are generally used in handheld cameras. There are some 1/3” sensor shoulder-mount cameras, but by and large the smaller sensor is typically used in handheld models. These cameras also generally have fixed (non-interchangeable)



lenses, and became very popular because of their lower cost, lighter weight, easy handheld operation, and features such as autofocus and image stabilization (features which are typically not found on lenses made for larger 2/3” cameras). Small sensor cameras frequently come equipped with zoom lenses with at least a 10:1 zoom range, and 13:1 or 14:1 are quite common; some stretch as far as 20x or more. The drawbacks to a small-sensor camcorder are usually related to sensitivity

and image noise; smaller sensors don’t render images as nicely as the larger sensors do. Additionally, for those who want to create images with shallow depth of field, it’s very difficult to achieve that look with such a small sensor.

Large Sensor Cameras

Super 35: In more recent years there’s been a trend towards (relatively) gigantic sensors, such as “Super 35,” a sensor that is about the same size as Super 35mm movie film. These sensors provide for excellent cinematic shal-



low depth of field, and have become extremely popular in filmmaking, music videos, and other such cinema-style productions where that shallow depth of field is so important.

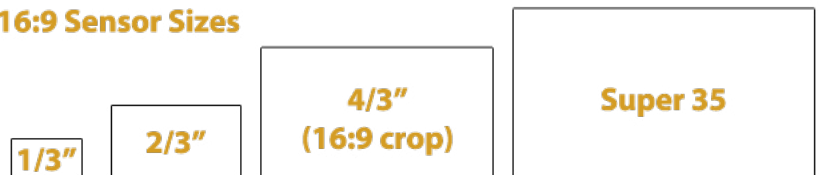
Lens Considerations On Large Sensor Cameras

Generally the type of lenses used on large-sensor cameras are either movie camera lenses, or stills-camera lenses (such as Nikon F or Canon EF-mount lenses). While well-suited to cinema productions, movie camera lenses are not as practical to use in traditional news-gathering, sports coverage, live events or other scenarios where the benefits of a smooth power zoom, auto-focus, or image stabilization would be useful. Furthermore, while the extremely shallow depth of field offered by these large sensors works to create artistic images in controlled environments and situations (such as on a movie set), it also can be challenging to maintain sharp focus in less-controlled environments (such as, for example, trying to track focus on a running player in a football game.) In those conditions, the shallowness of focus may work as a detriment towards the videographer capturing usable, quality footage. Additionally, prime lenses (by definition) don't zoom, so if you need a zoom lens, a large-sensor camera poses additional challenges. It's possible to mount genuine movie zoom lenses to these cameras, but movie lenses are (relatively) enormous, and (comparatively) extremely heavy, and (comparatively) astronomically expensive. As an example, the superb Fujinon 24-180 cinema lens offers a 7.5x zoom ratio, is 16" long, weighs nearly 20 pounds(!), and carries a list price in excess of \$87,000 US (at the time of this writing). Stills camera zoom lenses are much less expensive and they can be used, but stills camera lenses are not designed for zooming during a shot; they are, after all, designed for cameras that take one picture at a time, not continuous images such as a movie or video camera would do, so stills camera lenses may lose focus during a zoom, they may "breathe" during focusing, and they typically have very short zoom ranges (usually around 2:1 to 5:1, although exceptions do exist of course). Stills camera zoom lenses generally don't offer any sort of motorized power zoom, and may or may not offer any form of autofocus or image stabilization for motion picture filming. Movie camera lenses generally never offer image stabilization or autofocus. And it is highly uncommon to achieve typical video camera lens zoom ratios with either stills camera lenses or movie camera lenses.

The DVX200's 4/3" Sensor

With the introduction of the fixed-lens DVX200, Panasonic is creating essentially a new category of professional camcorder: a handheld camera about the same size and weight of a traditional

16:9 Sensor Sizes



1/3" camera, and that offers the benefits of a 1/3" camera's integrated power zoom lens, autofocus and image stabilization, but which also preserves the ability to create shallow depth of field similar to the Super 35 camcorder. The DVX200 uses a Four Thirds sensor, which is approximately four times larger than the 2/3" sensor, nearly 16x larger than the 1/3" sensor, and is reasonably close in size to a Super 35 sensor.

The design goal for the DVX200 is to provide high quality image acquisition with a large sensor, and the ability to create shallow depth of field as typically found with a large sensor, but to do it with the convenience, functionality, utility, and low cost of a traditional handheld camera's servo zoom lens.

Why A Fixed Lens?

By making and mating a dedicated fixed lens to the camera, it gives the design engineers the ability to employ several clever techniques that result in making the lens smaller than it would otherwise have to be, lighter than it would otherwise have to be, and less expensive than it would otherwise have to be. The DVX200 achieves a 13:1 zoom ratio in a lens that's only about 7" long, and weighs under 2 pounds. Remember, a 7.5:1 zoom ratio cinema lens like the Fujinon 24-180 is over twice as long (16" long) and ten times as heavy (the lens itself weighs approximately 20 pounds). By going with a fixed lens design, on a slightly smaller sensor, the engineers were able to create a Leica-certified lens that is compact in size, light in weight, yet still provides the zoom range of a traditional handheld camcorder -- while offering smooth powered zooming, and optical image stabilization, and autofocus capability.

The DVX200's lens is a complex system consisting of multiple groups of computer-controlled moving elements which work together to provide a 13x zoom range that covers a large sensor, while still remaining physically compact. Five aspherical elements and multicoating ensure performance that meets with Leica's approval, making crisp sharp images throughout the zoom range.

Advantages Of A Fixed Lens

While it's true that an interchangeable lens system would provide options that a fixed-lens system can't, it's also true that a fixed-lens system can do things that interchangeable lenses just don't. The DVX200 is designed to fill the role that a traditional handheld 1/3" camera would do, while offering the benefits of a much larger sensor. And it's designed to deliver the shallower depth of field of a larger-sensor camcorder, while retaining the flexibility and usability of an all-in-one handheld camcorder.

Interchangeable lenses offer the ability to pick and choose which lenses you want to use (which of course can be an advantage), but it also can be extremely expensive to collect a variety of lenses. The fixed lens offers a wide range of focal lengths, in a comprehensive all-in-one package.

Also, different lenses may render scenes slightly differently (example: some brands of lenses are sometimes said to be "cold" and "sharp", whereas other brands of lenses are sometimes described as "warm" and "smooth"). Both may be great premium brands and excellent lenses, but intercut-

ting footage between them might create issues that wouldn't have existed if you'd used just one brand or family of lenses. Of course, those issues also won't exist in a fixed lens camera since it's optimized to deliver consistent sharpness, color, contrast and clarity across its full zoom range.

When working with interchangeable lenses, you may have to pick and choose which lenses to bring with you, and have some way to carry them (especially, for example, when filming wildlife or nature). This can mean additional baggage, additional weight, and -- hopefully, you won't have forgotten a particular lens when you need it most. With the fixed-lens camera, you don't ever worry about any of that; the camera just does what it does, each and every time you pull it out of the bag. Provided that its fixed lens has a suitable zoom range for your intended purpose, it's really ready for most every common scenario.

Changing lenses in the field can lead to dust or contamination in the sensor, and using different lenses may mean complications in attaching filters if the various lenses you're using have different-sized filter rings. Those are, of course, non-issues with the fixed lens design.

Disadvantages Of The Fixed Lens

If you have a shot that requires an extraordinarily long telephoto lens or an extremely wide-angle lens, it's definitely easier to accommodate those shots with an interchangeable-lens camera and the appropriate specialty lenses. However, it's possible the fixed lens camera could be adapted to serve those purposes by the use of add-on teleconverter and wide-angle adapter lenses too.

Another time when the fixed lens might not be ideal is if you need an extremely open iris for low-light purposes or to create an extremely shallow depth of field. On an interchangeable-lens camera you could perhaps use a specialty fast-iris prime lens, and that wouldn't really be an option on the fixed-lens camera.

The fixed-lens system is not necessarily the best for every possible scenario; but it is a good choice for many conceivable shooting scenarios. No one camera can be the overall "best" for every possible shooting scenario, and there may be instances where an interchangeable-lens camera may perform a certain job better than a fixed-lens camera would, and vice versa.

Summary: The advantages of a fixed lens design include the ability to use a longer zoom range on a large sensor with a reasonable physical size and weight for the lens; consistency of images at all focal lengths; a practical zoom range; video-centric features such as smooth motorized servo zoom, autofocus, and optical image stabilization; and the convenience of an all-in-one solution, all at a cost much lower than traditional large-sensor lenses alone. Because of its fixed lens, the DVX200 can do many of the jobs that were traditionally the domain of the 1/3" fixed-lens camcorder, and because of its large sensor the DVX200 can also do many of the jobs that have traditionally been the domain of the large-sensor interchangeable-lens camera.

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