

The expert

Anders Uschold is a lecturer in digital image processing at the Faculty of Informatic at Munich Technical University (Technische Universität München) and also an official public expert in analogue and digital photography appointed by the Munich and Upper Bavaria Chamber of Commerce and Industry (Industrie- und Handelskammer für München und Oberbayern). In 2002 he published a scientific report on the performance of digital cameras fitted with lenses optimised either for 35mm systems or for digital photography. The study tested three 6-megapixel cameras with high-quality lenses designed for 35mm film cameras (often referred to as "analogue" lenses) and one 5-megapixel camera with a specially designed lens. He found that the camera with the lower resolution but an optimised lens was more effective than the higher resolution models with "analogue" lenses. A comparison of the net file sizes (defined by Uschold as the actual quantity of use-able data delivered by a camera) confirmed this finding. His verdict: "Despite the smaller sensor the optimised system delivers more useable data and therefore higher resolution."

Many other experts agree with this view. The supposed advantage of being able to use "analogue" lenses for digital photography is always at the expense of image quality. Anders Uschold's initial tests of the Olympus E-System confirm his 2002 finding: the Olympus E-1 tested in conjunction with the ZUIKO DIGITAL 50mm f2.0 Macro delivered excellent resolution values and thus net file sizes over a very wide range of apertures, especially in comparison with competitive models. The lens tested, the ZUIKO DIGITAL 50mm f2.0 Macro, achieved superb resolution from the picture centre right to the edges, whatever the f-number. The test also showed that the combination of the Olympus E-1 and the above lens succeeded in virtually eliminating the cornershading problem generally seen with lenses designed for 35mm SLR film cameras.



OLYMPUS E-SYSTEM



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*PROFESSIONALISM
ALWAYS SEEKS
THE OPTIMUM.*

The new Olympus E-System.

Cocktail image taken with Olympus E-1 System / Photographer: Jo van den Berg

The FourThirds Standard

4/3
FOURTHIRDS

THE FIRST FULLY DIGITAL

To date digital photography with professional SLR cameras has been a compromise between digital image recording and lenses designed for 35mm film cameras. In the new digital Olympus E-System, based on the innovative FourThirds Standard,



Photographer: Kanjo Take



Photographer: Kanjo Take



Photographer: Jo van den Berg

- The Olympus E-System is the first professional SLR system designed completely from scratch for digital photography.
- The lenses are designed specifically for digital technology, thus allowing the image sensor's potential to be fully exploited. As well as this the lenses are smaller, lighter and brighter, making the camera system as a whole more compact, more stable and easier to use.
- Thanks to a unique information exchange system, it is possible for lenses with extreme designs, such as super wide angle, to give information about the lens characteristics such as vignetting and distortion to the body. Based on this information the camera and the application software can compensate each other precisely. This is a valuable feature to overcome the limitations of optical lens designs.

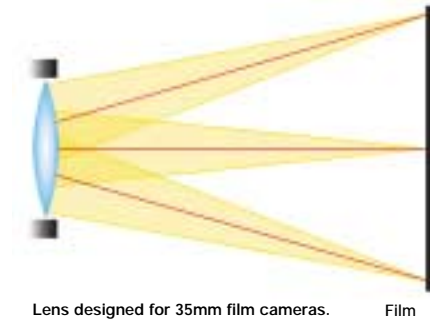
Reduced cornershading

The nature of a sensor's design means that quality is lost if the light does not fall on it at right angles. This phenomenon is particularly pronounced at the edges of the image, and is known as cornershading. It is primarily associated with digital cameras using full-format sensors where the light must be spread widely to reach the outer edges of the sensor.

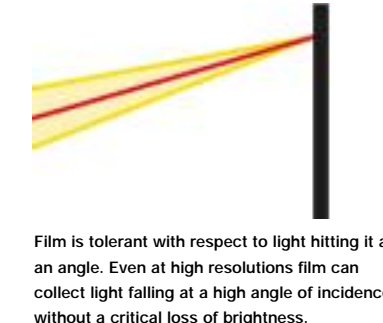
Each pixel has a light-gathering microlens, and things become critical when they have to catch light hitting at an angle since this reduces the microlenses' effective aperture. This leads to visible cornershading, which has to be rectified via cornershading correction.

However, the FourThirds Standard uses a near telecentric lens designed to ensure that the light passing through them will fall on the sensor at almost perpendicular angles.

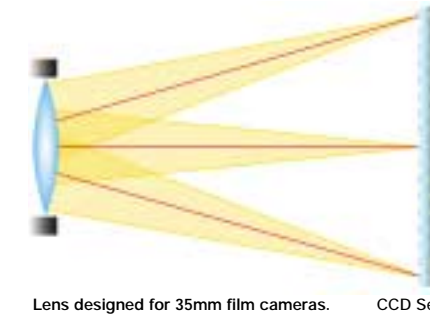
As well as this, the resolution of ZUIKO DIGITAL lenses is far higher than that of comparable lenses designed for use with 35mm film cameras. This ensures that equal or better detail resolution on the smaller focal plane format of a FourThirds CCD sensor is realised. Thereby full advantages can be taken of the resolving capability a CCD sensor offers.



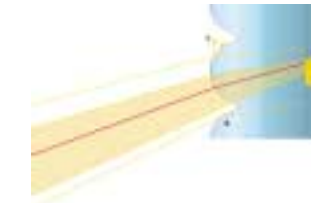
Lens designed for 35mm film cameras. Film



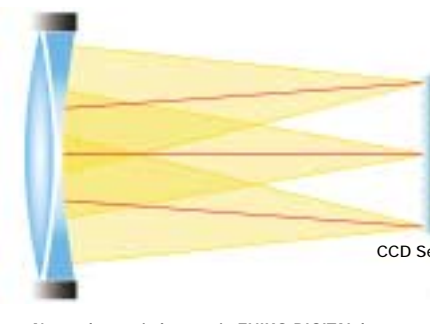
Film is tolerant with respect to light hitting it at an angle. Even at high resolutions film can collect light falling at a high angle of incidence without a critical loss of brightness.



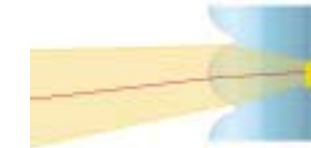
Lens designed for 35mm film cameras. CCD Sensor



Following effects occur when light hitting the sensor at high angles.
 1) Reflection onto neighbouring pixels
 2) Crosstalk between neighbouring pixels
 3) Loss of brightness since some of the light cannot be captured by the sensor.
 These effects reduce the signal to a lower signal to noise ratio and poor colour reproduction.



Near telecentric lens as in ZUIKO DIGITAL lenses. CCD Sensor



The near telecentric construction of lenses optimised for the FourThirds Standard ensures light hits the sensor at almost perpendicular angles. This guarantees edge to edge colour, clarity, and higher brightness.

What does "FourThirds" mean?

FourThirds is a reference to the size of the image sensor. The image sensor for FourThirds cameras is what is commonly referred to as a 4/3 type or 4/3 type sensor. This naming convention for image sensors dates back to the days when television cameras used vacuum tubes and the external diameter of the tube as fractions of inches was a guide to size. With the advent of solid state sensors (CCD and CMOS) this sizing convention continued, hence references to 1/1.8, 1/3, 2/3, 4/3 type sensors in the specifications of digital cameras. These describe the type of sensor not the actual size of the light sensitive area, which is normally much smaller.

For example, the FourThirds type sensor has a sensitive area with a diagonal measurement of 22.3mm (not FourThirds which would be 33.87mm).

The FourThirds standard was chosen because it achieves the optimum system performance giving the photographer ease-of-operation, versatility, economic pricing and most importantly, fantastic image quality.

The introduction of a standard makes it possible to homogenise the exit pupil.

Thus critical fluctuations of the exit pupil are avoided and the microlenses can be optimised to a lens midpoint, a process known as microlens shifting. As a result, the performance is consistently high, from wide angle to zoom lenses.

Since the cost-intensive adjustment of the exit pupils was not necessary with the use of film, and therefore was not made, digital cameras based on the 35mm system cannot be optimised to all focal distances.

<p>FourThirds format: approx. 18 x 13.5mm (diagonal: 22.5mm)</p>	
<p>APS format: approx. 24 x 16mm (diagonal: 28.8mm)</p>	
<p>35mm format: 36 x 24mm (diagonal: 43.3mm)</p>	

SLR-SYSTEM.

Olympus has combined its outstanding expertise in the fields of digital photography and optical technology and is setting new standards in the world of professional photography.



Photographer: Joachim Baldauf



Photographer: Kanjo Take



Photographer: Stefan Schütz

- The new FourThirds Standard ensures optimum image quality, camera formats and system versatility, and as an open standard offers entirely new opportunities for manufacturers and photographers all over the world.
- The Olympus Global Professional Service is a worldwide organisation offering the professional photographer the very highest standards of reliable and efficient service and support.

AT THE BEGINNING OF A NEW ERA STANDS A VISIONARY CONCEPT.

The combination of digital technology with lenses designed for 35mm film cameras is customary in currently available systems. However, it leads to loss of performance, particularly in the optical field, and a deterioration of image quality, which is incompatible with the uncompromising demands of professional photographers.

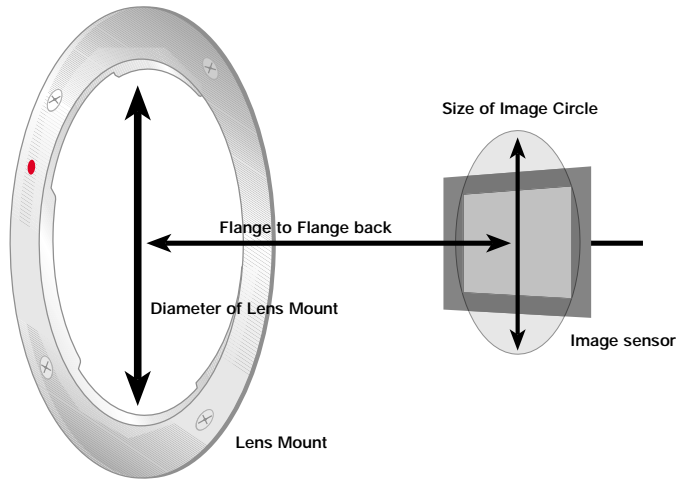
That is why Olympus decided, together with Kodak, to develop a new standard for digital SLR systems which would free professional digital photography from the shackles of 35mm film camera technology. The result was the FourThirds Standard.

A standard for the future

FourThirds is a completely new standard which has been designed with the specific demands of digital photography in mind. One major requirement for high image quality is to achieve perfect harmony between image sensors and lenses. Accordingly the primary goal during the design process was to maximise the performance of both. The size and weight of the product, and reasonable pricing for professional photographers were also important factors to be considered in the development process.

The FourThirds Standard comprises three levels:





1. Mechanical standards

To ensure lens interchangeability the type, size and shape of the bayonet mount has been standardised. The standard also defines precise dimensions for the distance between the lens flange and the focal plane (the flange back).

2. Optical standards

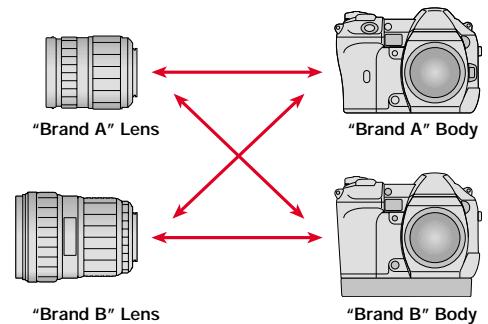
The FourThirds Standard fixes the size of the image circle, i.e. the diameter of the circle projected by the lens onto the focal plane. The lens mount is roughly twice as big as the image circle, a feature necessary to allow the light to fall at almost perpendicular angles onto the entire image sensor via the near telecentric lens elements, thus virtually eliminating cornershading.

3. Communication standard

The lens and camera body are no longer independent components. The FourThirds Standard has established a communication protocol allowing the two to exchange information.

An open standard

The FourThirds Standard has deliberately been designed as an open standard. That means the more body, lens and accessories manufacturers adopt the standard, the greater will be the degree of product compatibility. As a result, the range of equipment and options available to photographers will be all the greater.



Lenses specially designed for digital photography

All FourThirds Standard ZUIKO DIGITAL lenses from Olympus are specifically designed for digital photography. Their extremely high resolution, which is the outcome of a long and complex manufacturing process, exploits the full performance of the image sensor.



Only if each Pixel is provided with precise and individual information by the lens, the maximum resolution with detail reproduction down to the pixel level is possible. Most 35mm - lenses are not able to discriminate fine details to the diameter of a sensor's pixel especially in the corners and therefore they can not provide the sensor with the required precise information. A digital optimized lens has an significantly enhanced resolution below the pixel's diameter. Finest details do not "swap over" from one pixel to its neighbours.



Exact field of view

When lenses designed for 35mm film cameras are combined with a digital camera body fitted with smaller format sensors, the problem of a different angle of view arises. In particular, the wide angle capability will be reduced.

FourThirds prevents this phenomenon from occurring, since the lenses are always specifically designed for the sensor size. Thus, the angle of view you expect is always the angle of view you get.