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Digital Camera SPECIAL

SPRING 2017

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THE BIGGEST AND BEST PHOTOGRAPHY BUYERS' GUIDE

CAMERA SHOPPER

WELCOME to the Spring 2017 edition of Camera Shopper! Here you'll find all the best camera, lens and accessory reviews from our sister title Digital Camera Magazine, with jargon busting hints and tips on choosing your next photographic purchase .

We start out by answering one of the first questions any new photographer will ask – what's the best camera for beginners? The choice is wider than ever thanks to the boom in mirrorless cameras, but digital SLRs are still terrific value for money, and both types take interchangeable lenses for tackling any kind of subject.

We've included our ever-popular head-to-head comparisons, too. We find out how the new high-speed Nikon D500 compares against Canon's EOS 7D Mark II, and can the new full-frame Pentax K-1 topple the legendary Nikon D810?

But we don't just compare cameras. As usual, we have an entire section devoted to lenses, and this time we compare budget telephotos, lenses for sports and wildlife, macro lenses and more.

So I hope you enjoy this edition of Camera Shopper, and find that perfect photographic purchase!

Rod

Brought to you by Digital Camera

Camera Shopper is brought to you by the team behind *Digital Camera*, the UK's best-selling monthly photography magazine. Where issue numbers are mentioned inside, they relate to *Digital Camera*; back issues can be purchased from

www.myfavouritemagazines.co.uk/digitalcamera

CAMERA SHOPPER
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TRUSTED TESTS

RIGOROUS / ACCURATE / INDEPENDENT / FAIR

Cameras and lenses are run through a series of tests in our controlled laboratory environment

CAMERA Shopper is brought to you by the UK's most experienced team of photography journalists, which means you can trust everything you read on these pages and can buy your next piece of photography equipment with total confidence. In case you need any further convincing, here's why our tests are the best:

Depth

At Camera Shopper, we take great pride in the rigorous nature of our testing process. Every product and service is tested in appropriate circumstances, and a combination of real world and objective tests are performed to ensure all products and services are credibly graded. Take a look at the opposite page for more details.

Passion

We believe the best way to test a product is to use it as it was intended, so our real world testing involves taking equipment on a proper shoot – whether outdoors or in the studio – and testing it exactly as you would use it in real life to let you know whether it's fit for purpose.

Objectivity

Although scientific data won't tell you everything about a product, it's a great way to draw direct comparisons and sense-check our real world conclusions, so we've devised a series of controlled tests for cameras and lenses that supplement our real world testing with benchmarks.

Independence

Camera Shopper is 100% independent and never swayed by the influence of advertisers or PR firms. The tests you read in the magazine are our genuine unbiased opinions and Future Publishing, the company behind Camera Shopper, has a strict code of conduct on testing.

Consistency

We store data from every camera and lens test so that we can make full and standardised comparisons between products. We believe you don't just want to know how good these products are but how they compare with their rivals.

HOW WE TEST

Camera Shopper's test policy is the most strict and rigorous of any photography magazine. We believe the only way to bring you a genuine and reliable verdict on a product is to test it in both the field and the lab, so we use two sets of criteria to test SLRs and lenses – real-world testing and objective testing.

Real-world testing

The first and most important pillar of our process is real-world testing. We firmly believe that the best measure of a product is how it performs in the field (or studio) doing the job for which it was intended. The majority of our testing time is therefore spent using products in this way, so we can report back on how they cope under a number of different lighting scenarios and conditions.

The first part of our real-world testing involves telling you how a product handles and our impressions of its performance; the second is about examining the image quality produced, so we take a number of photographs under different conditions with every camera and lens we test, which means you can see the results achieved for yourself.

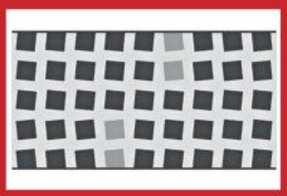
Benchmarking

The second pillar of our testing policy involves testing the output of cameras and lenses under controlled conditions. We shoot a series of test charts that are specifically designed to test different performance aspects of a camera or lens. Further details about the tests we perform can be found in the panel to the right.

The appliance of science

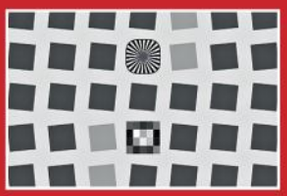
Camera Shopper runs tests under controlled conditions on both camera bodies and lenses. Lenses are assessed using an Imatest analysis of photos of three charts. We use both Imatest Master and DxO Analyzer to measure camera performance in four tests. Here's more about each test

Lens tests



1 DISTORTION: IMATEST
This test measures the distortion caused by the lens. We shoot the simple, lined chart pictured above and then output an accuracy percentage in Imatest. The most accurate result (i.e. the best) would be 0%.

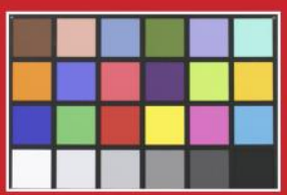
2 FRINGING: IMATEST
This test measures the occurrence of chromatic aberration. We shoot the same chart as for the other tests, then analyse the photos using Imatest. The results are expressed in pixels, with lower numbers being better.



3 SHARPNESS: IMATEST
Here we measure sharpness at different apertures from the centre to the outer edge. We shoot the chart pictured and Imatest outputs a figure based on line width divided by picture height – high numbers are better.

Camera tests

1 DYNAMIC RANGE: DXO ANALYZER
This is a measure of a camera's ability to capture detail in the highlights and shadows. We use DxO's transmissive chart, which enables us to test a dynamic range of 13.3 stops.



2 COLOUR ERROR: IMATEST
This measures colour reproduction. We shoot the X-Rite ColorChecker chart pictured above and output an accuracy percentage from Imatest, with 100% being the most accurate result possible.

3 NOISE: DXO ANALYZER
We use the dynamic range transmissive chart to analyse the signal-to-noise ratio for raw and JPEG files at every sensitivity setting using DxO Analyzer. A higher value means the signal is cleaner.

4 RESOLUTION
We use a resolution chart based on ISO-12233 from Applied Image Inc to indicate the limit of the camera's vertical resolution at the centre of the frame. The higher the value, the better the detail resolution.

To minimise the variables when testing SLRs, we use Sigma's 50mm f/1.4 EX DG HSM prime lens, which is available for every SLR camera system.

Next, we perform an analysis of the test images using Imatest's Imatest Master (www.imatest.com) and DxO Analyzer (www.dxo.com/intl/image_quality/dxo_analyzer) to generate benchmark figures for each test. These can then be plotted against the results from rival products to enable us to make a direct comparison and determine which performs better under a whole range of different test criteria.

Benchmarks shouldn't be seen as a substitute for real-world testing, though. We can test for a range of very specific performance criteria, but there are many more characteristics that only become apparent in actual use. Lab tests won't tell you which camera handles best in the field, for example, or which is easiest to use, but they do enable us to sense-check our lab results against real-world image tests and make accurate comparisons of products' capabilities.

No other magazine goes this far to deliver equipment test results you can really trust.

Scores explained

Each of our tests scores out of five in one or more sub-categories; then we award an overall mark out of five. *Digital Camera* is 100% independent – and never swayed by advertisers. The tests you read are our genuine, unbiased opinions. Our company has a strict code of conduct on testing – the most rigorous of any photo magazine.

★☆☆☆☆ Forget it

★★☆☆☆ Below average

★★★☆☆ Good for the price

★★★★☆ Very good all round

★★★★★ An exceptional, best-in-class product

Look out for our five awards

Given to the top product in a group test

For products that offer superb value for money

Given to products that receive five stars overall

Given to products that are innovative & groundbreaking

Given to products that merit very special attention

CAMERAS & ACCESSORIES

GET THE KIT YOU NEED WITH OUR IN-DEPTH REVIEWS

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CSC or SLR? What's the difference?

SINGLE-LENS-REFLEX or SLR cameras have a mirror that bounces light from the lens up into an optical viewfinder. It's a tried-and-tested design that's much loved by enthusiast and professional photographers alike.

Like SLRs, compact system or mirrorless cameras can accept interchangeable lenses, but they don't have a mirror inside; and if there is a viewfinder, it's an electronic device that shows the image that's formed on the sensor. The advantage of this approach is that you can see the impact of camera settings before you take a shot, so you know if you've set the correct exposure or if you're in black-and-white mode. However, autofocusing tends to be a little slower, especially in low light – although the technology is improving all the time. Another advantage of omitting the mirror is that it enables CSCs and their lenses to be smaller, even when the same-sized sensor is used.

Both types of camera are capable of producing high-quality images. Some people prefer the larger size, faster autofocusing and optical viewfinder of an SLR, while others like the innovative features, smaller size and full-time Live View of CSCs. See overleaf for more.

CSC vs SLR
10 KEY DIFFERENCES

So you want a decent camera that takes interchangeable lenses? A few years ago that was easy – you had to buy a DSLR. But then in 2009 Olympus launched its first mirrorless camera, the Pen E-P1, and everything changed.

Though it didn't change overnight. Mirrorless cameras are great in principle because they're smaller, lighter and mechanically simpler. They're also just like supersized compact cameras to use, whereas DSLRs are a bit of a jump from a regular compact. Enthusiasts and pros, however, have taken a bit of convincing – first, that the image quality is good enough to match a DSLRs; second, that the features and handling are comparable; third and most important, that these cameras will have a proper range of lenses to match those already available for DSLRs.

So have mirrorless cameras done enough to be genuine DSLR rivals or, more to the point, are they already better? To help you decide, here are the key differences and what they mean for everyday photography.

1

PRICE

DSLR You get more for your money with a cheap DSLR than a cheap CSC

CSC Cheap CSCs don't have viewfinders; those that do cost a good deal more

You might hope that the simpler design of a compact system camera would make them cheaper to buy, but that's not the case. If you want a fully-featured, 'proper' camera for the least money, then a DSLR is the cheapest option.

For example, the 24Mp Nikon D3300 DSLR has just about the best APS-C sensor currently on the market, an optical viewfinder (of course), decent manual controls and 700-shot battery life. Its nearest rivals on price in the compact system camera market can't match its resolution or its battery life and they don't have viewfinders.

In fact, the cheapest CSC with a viewfinder at the time of writing is the 16Mp Olympus OM-D E-M10, which currently sells for around 30% more than the Nikon D3300 – and it's only that cheap because it's just been superseded.

Once you get into enthusiast and pro market, however, the differences largely disappear – for any given amount of money you get broadly the same features, performance and power.

2

BATTERY LIFE

DSLR 600-800 shots is average, better models can shoot over 1,000 shots on a charge

CSC Much weaker, and typically around 300-400 shots. You'll need spare batteries

Battery life comparisons might not be exciting, but they are important when the differences are as great as this. The Nikon D7200 DSLR, for example, can take 1,100 shots on a single charge, while the Fuji X-T1 CSC, a close match on paper, can only shoot 350 photos before the battery expires. This pattern is repeated across the range of DSLRs and CSCs.

It's not clear why. DSLR batteries are sometimes larger, though not always, and you might have thought that driving the mirror up and down for each shot would consume more power, and that that LCD display would be used just as much.

Apparently not, though, and this is one area where DSLRs do often have a substantial practical advantage.

DSLRs are pretty frugal with battery power, whereas compact system cameras typically use them up twice as fast.

3

SIZE AND WEIGHT

DSLR Yes, they're fat and chunky, though this can be a help for big lenses (and big hands)

CSC Yes, they are smaller and lighter, but the lenses (mostly) are just as big as a DSLR's

Small size is one of the big selling points for mirrorless cameras, but it doesn't always work out that way because what you actually have to take into account is the size of the camera body and lens combination. This is a problem for APS-C mirrorless cameras because you can get a nice slim body but a fat, heavy kit lens. Some now come with retractable or power-zoom lenses but that doesn't help when you have to swap to a different type of lens.

Panasonic and Olympus cameras have an advantage here. The Micro Four Thirds sensor format is smaller (which many photographers don't like) but this means the lenses are smaller and lighter too (which many do).

4

LENSES

DSLR Canon and Nikon have a massive lens range for every job, and Pentax is not far behind

CSC Olympus, Panasonic and Sony have big ranges, while Fujifilm has a good number of high-quality optics

If you want the widest possible choice of lenses, then a Canon or Nikon DSLR is possibly the best best, but mirrorless cameras are gaining ground. Sony mirrorless cameras are well supported now – though more fast prime lenses and constant aperture zooms would help – and Panasonic and Olympus use the Micro Four Thirds format, which now has a large and established lens range behind it.

5

CONTINUOUS SHOOTING

DSLR The best DSLRs can no longer match the speeds of the best CSCs

CSC The mirrorless design makes it easier to add high-speed shooting

You need a fast continuous shooting mode to capture action shots, and compact system cameras are streaking ahead here, partly because the mirrorless system means there are fewer moving parts and partly because many models are now pushing ahead into 4K video – this demands serious processing power, which helps with continuous shooting too.

To put this in perspective, Canon's top professional DSLR can shoot at 14 frames per second, but the mirrorless Olympus E-M1 II can shoot at an incredible 60fps. Panasonic, meanwhile, is pioneering the use of 4K video to capture 8-megapixel images at 30 frames per second.

6

VIDEO

DSLR Massively popular with pros but, arguably, only because DSLRs got there first

CSC 4K video becoming more common, better live view AF – this looks like the future

Most pros shooting video use a DSLR, but that says more about the rather conservative professional market than the technology. DSLRs were the first to offer professional HD and full HD video, together with a vast range of lenses and other accessories, and pros prefer systems with solid, long-term support.

But that was then. The industry is waking up to the potential offered by mirrorless technology, including 4K video (still not common on consumer DSLRs), efficient live view autofocus and high-speed data readout and processing. The Panasonic GH4, for example, has had a big impact as a hybrid stills/video camera that's equally good in both roles, rather than a stills camera adapted to shoot video.

7

FEATURES

DSLR Even entry-level models have full manual controls, and DSLRs are powerful cameras

CSC They match DSLRs feature for feature, often going a step or two further

In terms of photographic features and controls, DSLRs and CSCs are hard to split. They all offer full manual control over exposure and focusing and can shoot raw files as well as JPEGs. In any one sector, such as entry-level cameras, enthusiast or pro models, the control layouts and capabilities are pretty similar. Entry-level DSLRs tend to hide away the manual controls under a layer of automation, but it's the same for CSCs.

Keep in mind the point about viewfinders, though – all DSLRs have viewfinders, but cheaper compact system cameras don't.

Compact system cameras have advantages for both high-speed continuous shooting and 4K video capture, though the battle isn't over

8

AUTOFOCUS

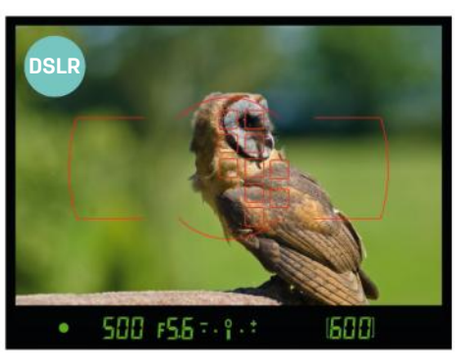
DSLR Still better, on the whole for tracking fast subjects, but weak in live view mode

CSC Full time live view AF means faster shooting when using the LCD screen

DSLRs use fast and efficient 'phase detection' autofocus modules mounted below the mirror in the body, but these only work while the mirror is down. If you're using a DSLR in live view mode, composing a picture or video on the LCD display, the mirror has to be flipped up and the regular AF module is no longer in the light path, so DSLRs have to switch to a (generally) slower sensor-based autofocus system.

Some Canon DSLRs have hybrid AF using phase-detection pixels built into the sensor. This gives faster autofocus in live view mode to close the gap on CSCs, but this technology is currently the exception for DSLRs rather than the rule.

CSCs use sensor-based autofocus all the time but it's tuned for speed and efficiency. More advanced models have advanced 'hybrid' AF systems combining contrast autofocus with phase-detection pixels on the sensor, and the best are now so fast that they're getting almost as good as DSLRs at locking onto and following moving subjects. Panasonic and Olympus cameras use a smaller Micro Four Thirds sensor format, but this means the lenses are smaller and lighter too, which is a real advantage for many photographers.



DSLRs use phase detection AF sensors. They're fast, especially with moving subjects.

9

VIEWFINDERS

DSLR Many still prefer an 'optical' view for its clarity, natural look and lag-free viewing

CSC Others prefer to see a digital rendition of the scene as the camera will capture it

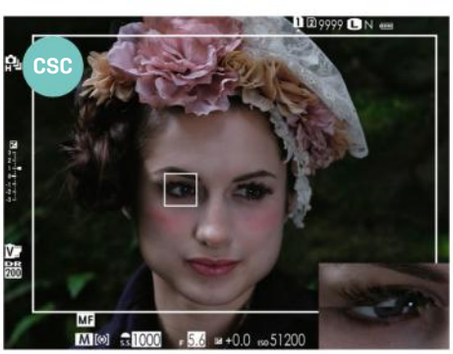
All DSLRs, even the cheapest, come with an optical viewfinder because it's an integral part of the DSLR design. However, many compact system cameras don't have viewfinders at all, so you have to use the rear LCD to compose photos, which doesn't always work so well in bright light.

Compact system cameras with viewfinders cost more, and these are electronic rather than optical viewfinders – they display the image direct from the sensor readout and not via an optical mirror/pentaprism system.

Electronic viewfinders are advancing in leaps and bounds, so the latest rarely show any pixelation or 'granularity', though there can often be a slight but visible 'lag' if you move the camera quickly.

The advantage of electronic viewfinders is that they can display a lot more information than an optical viewfinder, including live image histograms, for example. They can also simulate the digital image the camera will capture.

This simulation is not always perfect, however, and many photographers prefer to see the world with their own eyes as they compose the image and check the digital version on the LCD straight after it's been



CSCS use electronic viewfinders capable of displaying much more shooting information.

10

IMAGE QUALITY

DSLR DSLRs use the latest and best state of the art APS-C or full frame sensors

CSC They use the same sensors, but there are also smaller formats for smaller cameras

There's nothing to choose here either. Currently, the highest resolution is in a DSLR, the 50Mp Canon EOS 5Ds, but the 42.5Mp Sony A7R II isn't far behind.

It's not just about megapixels, though, because the main factor in image quality is sensor size. Full frame sensors are the biggest and offer the best quality, while cameras with APS-C sensors are almost as good and much cheaper – and you can get these sensor sizes in both DSLRs and CSCs.

But the compact system camera market offers smaller formats too. The Micro Four Thirds format used by Panasonic and Olympus is smaller than APS-C, but so are the cameras and lenses.

Overall, then, there's no intrinsic image image quality advantage in a DSLR, given that the same sensor sizes are available in compact system cameras too.

Verdict

The technical differences between DSLRs and CSCs aren't the only things you need to consider, and may not even be the most important. The only way to decide once and for all is to pick them up and try them out to see which you prefer. You might prefer the chunky feel and optical viewfinder of a DSLR or you might like the smaller body and more precise feel of a CSC.
For those on a budget, a cheap digital SLR gives you more than a cheap compact system camera. Further up the price range it's closer, and you'd have to say that while some might prefer their viewing system, there are few technical advantages to the DSLR design.

BEGINNERS' CAMERAS

Matthew Richards tests eight starter camera-and-lens combinations

FOR most beginners, choosing their first 'proper' camera is an important step. While any camera is only really a tool, or a means to an end, the right one can have the power to fascinate, delight and inspire us.

Unlike most simple point-and-shoot compact cameras, or even a smartphone, an SLR or CSC (compact system camera) offers a great deal of versatility. Interchangeable lenses enable you to shoot a wide range of subjects. We've chosen models with viewfinders.

Beginners' cameras should be easy to use, with intuitive controls, and effective auto and scene modes. But they should also be sophisticated enough to grow with you as you learn new skills and advanced techniques.

THE CONTENDERS

1	**Canon** EOS 1300D with 18-55mm IS II lens	£320/$450
2	**Canon** EOS 750D with 18-55mm IS STM lens	£530/$700
3	**Fujifilm** X-T10 with 16-50mm XC II lens	£550/$900
4	**Nikon** D3400 with 18-55mm AF-P VR lens	£430/$650
5	**Nikon** D5500 with 18-55mm AF-P VR lens	£670/$700
6	**Olympus** OM-D E-M10 II with 14-42mm lens	£400/$700
7	**Panasonic** Lumix G7 with 14-42mm lens	£430/$800
8	**Pentax** K-50 with 18-55mm WR lens	£420/$450

Alex Sun / Shutterstock

Canon EOS 1300D

with 18-55mm IS II lens £320/$450

It's the cheapest, but is it good value?

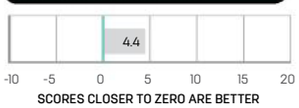
THE least expensive camera kit in the group, the 1300D is Canon's most basic SLR. But it has barely anything new to offer, like a hangover of the 1200D that it replaces, with the addition of built-in Wi-Fi and NFC.

The image processor gets a minor update and the LCD screen is more high-res than in the 1200D, but it's still not a touchscreen. The 18-55mm IS II kit zoom lens is relatively antiquated, and a poor substitute for the STM (Stepping Motor) edition that's sold with Canon's other entry-level cameras.

Performance

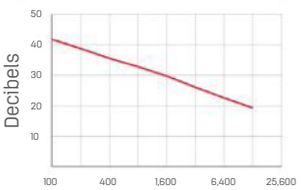
The nine-point phase-detection autofocus system is the most basic of any camera on test, with only a single cross-type point at the centre (able to resolve detail in both vertical and horizontal planes). Contrast-detection autofocus in Live View mode is painfully slow, and continuous AF is unavailable when shooting movies. The maximum drive rate of 3fps (frames per second) is also pedestrian. The 1300D is very easy to use, and delivers pleasing image quality, but it's a camera you might soon grow out of.

COLOUR ACCURACY



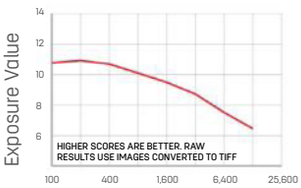
Colour rendition is fairly accurate on the whole, but can look a little over-saturated.

SIGNAL-TO-NOISE RATIO



Noise at high settings is better controlled than the 1200D, but worse than the 750D.

DYNAMIC RANGE



Good retention of highlight and shadow detail, even in high-contrast scenes.

VERDICT

FEATURES	★★★☆☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★½☆
VALUE	★★★★☆
OVERALL	★★★★☆

Canon EOS 750D with

18-55mm IS STM lens £530/$700

More than worth the extra outlay

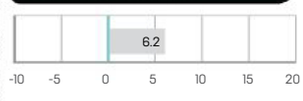
DESPITE being an older model, this camera is streets ahead of the 1300D. It has a 24.2MP sensor, an image processor that's two generations newer, a sophisticated 19-point autofocus system (all cross-type), a hybrid secondary autofocus system for Live View and movie capture, and a revamped metering system. There's also continuous autofocus when shooting movies, with smooth and virtually silent focus transitions in the STM (Stepping Motor) kit lens.

There's a better implementation of Canon's Quick menu for easy adjustment of important shooting settings, thanks to the LCD being a fully pivoting touchscreen. Other upgrades over the 1300D include an 'intelligent' viewfinder, plus extra scene modes. Wi-Fi and NFC are present.

Performance

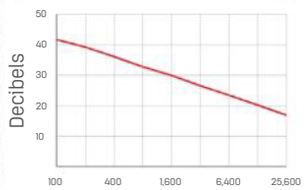
Continuous shooting is nippy at up to 5fps, and the autofocus and metering systems are highly effective. Overall, performance and image quality are excellent, and the 750D does a good job of suppressing image noise at high ISO settings, despite having one of the highest megapixel counts here.

COLOUR ACCURACY



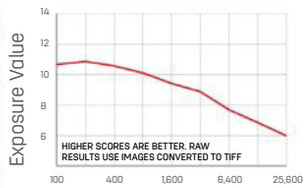
Images have very natural colour rendition, without the 1300D's slight over-saturation.

SIGNAL-TO-NOISE RATIO



Despite the higher-res sensor, image noise is better controlled than in the 1300D.

DYNAMIC RANGE



Highlight and shadow detail are enhanced by Canon's Auto Lighting Optimizer.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

Fujifilm X-T10

with 16-50mm XC II lens £550/$900

Compact build, big feature set

THE first of the compact system cameras on test, the X-T10 has a slim and retro-styled design, similar to the Olympus E-M10 II. This is enabled by the omission of a conventional reflex mirror but, as with the other CSCs in the group, the Fujifilm sports a high-resolution electronic viewfinder to enhance handling and make shooting easier in bright sunlight.

Shooting from tricky angles is aided by a tilt mechanism for the LCD screen, although it lacks a full pivot facility. The screen also lacks touch-sensitivity, but the Quick shooting menu is easy to navigate with the four-way pad. The shutter speed dial seems like a bit of a throwback, but the camera is easy to operate in Aperture Priority and Shutter Priority modes, as well as in Auto and scene modes.

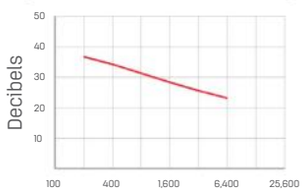
Performance

The hybrid autofocus system is fast and accurate, while light metering is consistent. The 8fps maximum burst rate is impressive, and image quality is excellent. The controls aren't quite as intuitive as in the SLRs on test, but the X-T10 is easy to use nonetheless.

COLOUR ACCURACY

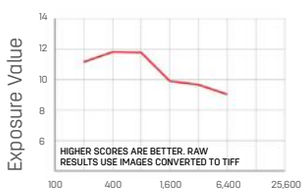
Auto white balance can be on the cool side, but images tend to be punchy and vibrant.

SIGNAL-TO-NOISE RATIO



The 16.3MP resolution APS-C sensor gives clean images at high ISO settings.

DYNAMIC RANGE



The X-T10 manages to retain good levels of detail in bright and dark areas within scenes.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★★½
OVERALL	★★★★½

Nikon D3400 with

18-55mm AF-P VR lens £430/$500

It's more of the same from Nikon

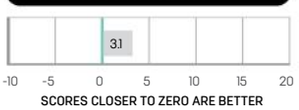
NIKON hasn't gone overboard updating the D3300 to the new D3400. It has the same image sensor and processor, the most notable upgrade being that the D3400 gains wireless connectivity. Strangely, though, it's Bluetooth rather than the usual Wi-Fi and NFC. Bluetooth has a longer connection range than NFC, but pairing other devices is more long-winded. Wi-Fi is absent.

The D3400 is enormously beginner-friendly, sporting an interactive, pictorial shooting guide. Battery life is very good, but downgrades from the D3400 are a weaker pop-up flash and the removal of auto sensor cleaning.

Performance

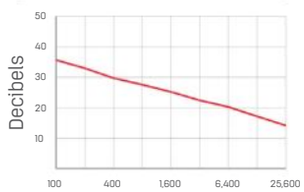
The biggest boost is in Nikon's new AF-P (stepping motor) kit lens, rather than the camera itself. As with competing lenses used in all but the Canon 1300D and Pentax K-50 kits, this enables smooth and near-silent autofocus for movies, and electronic fly-by-wire manual focusing. The D3400 edges ahead of the Canon 1300D in practically every area of performance and specs, but it's still a basic camera and poorer value for money.

COLOUR ACCURACY



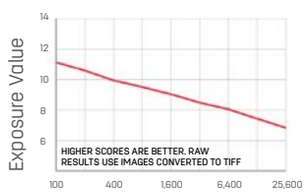
Typical of many Nikon cameras, there's a slight tendency to boost green hues.

SIGNAL-TO-NOISE RATIO



The D3400 strikes a good balance between suppressing noise and retaining fine detail.

DYNAMIC RANGE



Nikon's Active D-Lighting broadens the dynamic range to cope with high contrast.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★★☆
VALUE	★★★☆☆
OVERALL	★★★½☆

Nikon D5500 with 18-55mm AF-P VR lens £670/$700

An articulate and feature-packed Nikon

THE D5500 looks pricey in the UK compared to the USA – but the British kit includes the new AF-P stepping motor lens, rather than the older AF-S version. Although the camera has the same image sensor and processor as the D3400, a crucial upgrade is the 39-point autofocus system (nine cross-type), compared with just 11 AF points (one cross-type) on the D3400.

Handling is improved over the D3400, thanks to a slimmer body shell. Both cameras are lacking in direct access buttons for adjusting shooting settings. However, making changes via the 'i' (information) menu is much more intuitive in the D5500, thanks to the LCD's touchscreen and pivot facilities. You also get built-in Wi-Fi instead of Bluetooth.

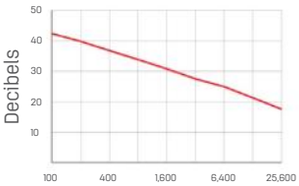
Performance

Performance is similar in the two cameras, but the D5500 produces slightly cleaner high-ISO images, and dynamic range is marginally better. Autofocus is more accurate than in the D3400 when using peripheral AF points, but metering tends to produce lighter images, which look less richly saturated.

COLOUR ACCURACY

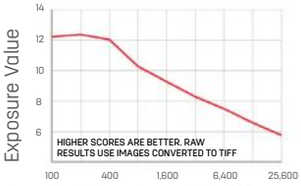
Saturation can be less rich than in the D3400; auto white balance be slightly cool.

SIGNAL-TO-NOISE RATIO



There's good retention of fine detail with minimal image noise at high ISO settings.

DYNAMIC RANGE



For outright dynamic range in the ISO 100-400 area, it's one of the best here.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★½☆
OVERALL	★★★★☆

Olympus OM-D E-M10 II with 14-42mm lens £400/$700

Something of a style classic

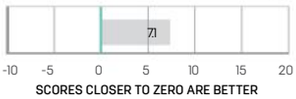
OLYMPUS has won the hearts of retro design fans with its OM-D range of cameras, the E-M10 II being the latest entry-level model. Attractions include a high-resolution electronic viewfinder and tilting touchscreen, along with an excellent in-camera image stabilisation system.

This Olympus isn't quite as beginner-friendly as the similarly styled Fujifilm X-T10. For example, buttons labelled merely Fn1 and Fn3 are likely to baffle anybody who's new to the camera. The flip side is that there's a good level of customisation in the mostly intuitive menu system, so you can tailor the operation of the camera to your liking as your expertise grows.

Performance

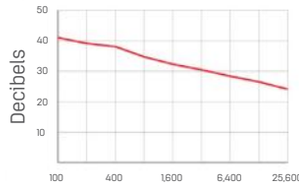
Like the Panasonic on test, this is a Micro Four Thirds camera with a relatively small image sensor and contrast-only rather than hybrid autofocus. Even so, autofocus speed is rapid and image noise at high ISO settings is fairly minimal, albeit with a slight loss of fine detail. Image quality is very pleasing overall, and handling feels natural and comfortable for such a small camera.

COLOUR ACCURACY



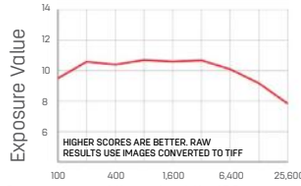
The Auto white balance setting produces slightly warm but appealing colour rendition.

SIGNAL-TO-NOISE RATIO



The E-M10 II isn't a star performer at high ISO settings, with image noise visible.

DYNAMIC RANGE



Scores are good throughout the ISO range, beating most of the other cameras.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★☆
VALUE	★★★★☆
OVERALL	★★★★☆

Panasonic Lumix G7

with 14-42mm lens £430/$800

Bulkier than the average CSC

DESPITE having a slim body, the G7 has big and bulky hand grip and viewfinder protrusions. It looks and feels bigger than the other CSCs on test, yet handling is a little more natural. Beginners might find the dials and buttons slightly daunting – there are five customisable Fn buttons, although their default assignments are clearly labelled.

Some of the control buttons can seem superfluous, since many of the functions are easily accessed via the on-screen Quick menu. The LCD benefits from being a touchscreen, as well as boasting full articulation. A claim to fame of the G7 is that it's the only camera in this group to boast 4K ultra-high-definition movie capture.

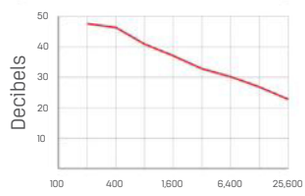
Performance

Performance is good overall, but the metering system errs on the side of overexposure, sometimes giving rise to a lack of highlight definition and colour saturation. Image noise at high ISO settings is the worst of any camera in the group, and the maximum bulb exposure time is a mere two minutes, making the G7 a poor candidate for night shots.

COLOUR ACCURACY

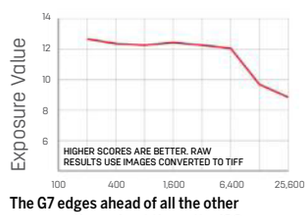
Colour balance is accurate but over-exposure can result in images with poor saturation.

SIGNAL-TO-NOISE RATIO



Images taken at medium to high ISO settings are the noisiest of any camera on test.

DYNAMIC RANGE



The G7 edges ahead of all the other cameras, throughout the entire ISO range.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★☆☆
PERFORMANCE	★★★½☆
VALUE	★★★½☆
OVERALL	★★★★☆

Pentax K-50

with 18-55mm WR lens £420/$450

Classier than competing SLRs

PMARKET features in the K-50, but lacking in the Canon and Nikon SLRs on test, include a pentaprism rather than pentamirror viewfinder and sensor-shift image stabilisation that works with any attached lens. The K-50 has a faster shutter speed and continuous drive rate of 1/6000th of a second and 6fps respectively, and a higher maximum sensitivity of ISO 51,200. Everything's in a sturdy casing that's weather-sealed, as is the kit WR zoom lens.

It's not all good news, however. The kit lens has a noisy autofocus system that's driven from a motor in the camera body, and there's no continuous AF mode when shooting movies. The K-50 is the only camera in the group to lack any form of wireless connectivity, and the screen lacks touch-sensitivity and articulation.

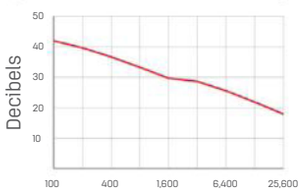
Performance

The K-50 performs well in almost all areas. An exception is that the multi-segment light metering option often results in under-exposure for high-contrast scenes, delivering dull-looking images with muddy colour rendition.

COLOUR ACCURACY

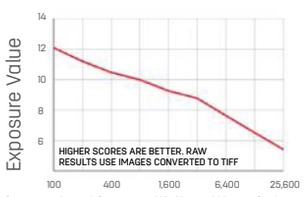
Accuracy can be hampered by under-exposure in multi-segment metering mode.

SIGNAL-TO-NOISE RATIO



The sensitivity range stretches a long way, but noise is obvious above ISO 6,400.

DYNAMIC RANGE



Impressive at low sensitivity settings, but more average at mid to high ISO values.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★½☆
VALUE	★★★★★
OVERALL	★★★★☆

THE VERDICT

It's Canon for starters

The EOS 750D is our favourite entry-level camera

THE Canon 750D is so intuitive and easy to use that complete beginners should be able to take it out of the box and start getting satisfying shots. Beneath its 'intelligent' auto modes and its wide-ranging scene modes lurks a powerful and versatile camera, complete with advanced controls that will keep you satisfied as you grow in expertise.

By contrast, the Canon 1300D is the least inspiring camera in the whole group. Second and third places go to the Fujifilm X-T10 and Olympus OM-D E-M10 II respectively, proving not only that sophisticated cameras can be reasonably easy for beginners to get along with, but also that CSCs really are taking the fight to conventional SLRs.

The Nikon D3400 is more beginner-friendly than any of the CSCs on test but, ultimately, it has a basic feature set that can soon feel underwhelming. The D5500 lacks the D3400's interactive guided shooting mode, but its pivoting touchscreen is handy, and custom functions add sophistication.

The weather-sealed Pentax K-50 is well built and includes a wealth of high-end features. It's only let down by the vagaries of its multi-segment metering mode. The Panasonic G7 is a good camera, but not the easiest for beginners to get to grips with.

HOW THE CAMERAS COMPARE








	Canon EOS 1300D, 18-55mm	Canon EOS 750D, 18-55mm	Fujifilm X-T10, 18-55mm	Nikon D3400, 18-55mm	Nikon D5500, 18-55mm	Olympus OM-D E-M10 II, 14-42mm	Panasonic Lumix G7, 14-42mm	Pentax K-50, 18-55mm
Website	www.canon.co.uk	www.canon.co.uk	www.fujifilm.co.uk	www.nikon.co.uk	www.nikon.co.uk	www.olympus.co.uk	www.panasonic.co.uk	www.pentax.co.uk
Street price	£320/$450	£530/$700	£550/$900	£430/$500	£670/$700	£400/$700	£430/$800	£420/$450
Type	SLR	SLR	CSC	SLR	SLR	CSC	CSC	SLR
Sensor (size)	18MP CMOS (APS-C)	24.2MP CMOS (APS-C)	16.3MP CMOS (APS-C)	24.2MP CMOS (APS-C)	24.2MP CMOS (APS-C)	16.1MP CMOS (Four Thirds)	16MP CMOS (Four Thirds)	16.3MP CMOS (APS-C)
Lens mount (crop factor)	Canon EF-S (1.6x)	Canon EF-S (1.6x)	Fuji X (1.5x)	Nikon DX (1.5x)	Nikon DX (1.5x)	Micro Four Thirds (2.0x)	Micro Four Thirds (2.0x)	Pentax KAF2 (1.5x)
Viewfinder	Pentamirror, 0.8x, 95%	Optical (pentamirror)	Optical (pentamirror)	Optical (pentamirror)	Optical (pentamirror)	Electronic (2.36M dots)	Electronic (2.36M dots)	Optical (pentaprism)
ISO range (expanded)	ISO 100-6,400 (12,800 exp)	ISO 100-12,800 (25600 exp)	ISO 200-6,400 (100-51,200)	ISO 100-25,600	ISO 100-25,600	ISO 200-25,600 (100)	ISO 200-25,600 (100)	ISO 100-51,200
Primary autofocus	Phase (9 points, 1 cross-type)	Phase (19 points, all cross-type)	Hybrid (77 areas)	Phase (11 points, 1 cross-type)	Phase (39 points, 9 cross-type)	Contrast (81 areas)	Contrast (49 areas)	Phase (11 points, 9 cross-type)
Shutter speeds	30-1/4,000 sec, Bulb	30-1/4,000 sec, Bulb	30-1/4,000 sec, Bulb	30-1/4,000 sec, Bulb	30-1/4,000 sec, Bulb	60-1/4,000 sec, Bulb 30 min	60-1/4,000 sec, Bulb 2 min	30-1/6,000 sec, Bulb
Max burst rate	3fps	5fps	8fps	5fps	5fps	8.5fps	6fps (8fps AF-S)	6fps
Flash	Pop-up + hotshoe	Pop-up + hotshoe	Pop-up + hotshoe	Pop-up + hotshoe	Pop-up + hotshoe	Pop-up + hotshoe	Pop-up + hotshoe	Pop-up + hotshoe
Image stabilisation	Via lens	Via lens	Via lens	Via lens	Via lens	In-camera	Via lens	In-camera
Video - max resolution	1080p, 30/25/24fps	1080p, 30/25/24fps	1080p, 60/50/30/25/24fps	1080p, 60/50/30/25/24fps	1080p, 60/50/30/25/24fps	1080p, 60/50/30/25/24fps	4K, 30/25/24fps	1080p, 30/25/24fps
LCD screen	3.0-inch, 920k, fixed	3.0-inch, 1,040k, pivot, touch	3.0-inch, 920k, tilt	3.0-inch, 921k, fixed	3.2-inch, 1,037k, pivot, touch	3.0-inch, 1,037k, tilt, touch	3.0-inch, 1,040k, pivot, touch	3.0-inch, 921k, fixed
Memory	SD/HC/XC	SD/HC/XC (UHS-I)	SD/HC/XC (UHS-I)	SD/HC/XC (UHS-I)	SD/HC/XC (UHS-I)	SD/HC/XC (UHS-I)	SD/HC/XC (UHS-II)	SD/HC/XC
Wireless	Wi-Fi, NFC	Wi-Fi, NFC	Wi-Fi	Bluetooth	Wi-Fi	Wi-Fi	Wi-Fi	None
Body (W x H x D), weight	129 x 101 x 78mm, 485g	133 x 100 x 79mm, 580g	118 x 83 x 41mm, 381g	124 x 98 x 76mm, 445g	124 x 97 x 70mm, 470g	120 x 83 x 47mm, 390g	125 x 86 x 77mm, 410g	129 x 97 x 70mm, 650g
Battery life (Cipa)	500 shots	440 shots	350 shots	1,200 shots	820 shots	320 shots	360 shots	410 shots
FEATURES	★★★½☆	★★★★★	★★★★½	★★★½☆	★★★★½	★★★★½	★★★★☆	★★★★☆
BUILD & HANDLING	★★★½☆	★★★★½	★★★★½	★★★½☆	★★★★☆	★★★★½	★★★☆☆	★★★★☆
PERFORMANCE	★★★½☆	★★★★★	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★½☆	★★★½☆
VALUE	★★★★☆	★★★★½	★★★★½	★★★☆☆	★★★½☆	★★★★☆	★★★½☆	★★★★☆
OVERALL	★★★½☆	★★★★★	★★★★½	★★★½☆	★★★★☆	★★★★½	★★★★☆	★★★★☆

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SLR www.canon.co.uk

Canon EOS 760D

£579/$849

Angela Nicholson puts Canon's more advanced new 24MP APS-C format SLR through our full testing procedure...

SPECIFICATIONS

Sensor _ 24.2MP APS-C (22.3 x 14.9mm) CMOS sensor
Focal Length conversion _ 1.6x
Memory _ SD/SDHC/SDXC
Viewfinder _ Optical viewfinder, 95% coverage, 0.82x magnification
Video resolution _ Full HD (1,920x1,080 pixels) at 30, 25 or 24fps
ISO range _ ISO 100-12,800 (expandable to 25,600)
Autofocus points _ 19
Max burst rate _ 5fps
LCD Screen size _ 3-inch; 1,040,000 dots
Shutter speeds _ 1/4,000-30 sec, Bulb
Weight _ 565g (inc battery and memory card)
Dimensions _ 131.9 x 100.9 x 77.8mm
Power supply _ LP-E17 Li-ion battery (supplied with camera)

The new metering system in the cameras produces good results even in very tricky conditions

WITH three cameras in its entry-level range Canon already had plenty to interest novices and enthusiast photographers on a budget. Now the company has replaced the 700D with two models, the EOS 760D and 750D, rather than one.

As the 700D continues in the line-up (for now at least), this means that there are five cameras in what Canon calls its beginners' range. The new 760D and 750D, known as the Rebel T6s and T6i in the US, sit at the top of this group above the 700D, 100D and 1200D.

The 760D is designed with more experienced photographers in mind than the 750D, and has a few features from Canon's high-end cameras. In this review we're going to concentrate on the 760D, but you can find out more about the 750D on page 14.

Features

Although they are aimed at slightly different people, the Canon 760D shares many components with the 750D. For a start they both have Canon's new APS-C format CMOS sensor with an effective pixel count of 24.2 million, a Digic 6 processing engine and a phase detection autofocus system, with 19 cross-type points for use when focusing images in the viewfinder. The cameras can select the appropriate AF point to use automatically in 19-point AF mode, or it can be set manually in groups in Zone AF mode (there are five groups of points for selection) or individually in Single-point AF mode.

There's also Canon's new Hybrid CMOS AF III system (with Face Detection, Tracking AF, FlexiZone-Multi and FlexiZone-Single modes), for use when images or video are composed on the screen in Live View mode. This system has a greater number of focusing pixels, set in a more regular array than before. Canon says it's about four times faster than version II (used in the EOS 100D).

Despite the increase in pixel count in comparison with the 700D, which has 18 million pixels, the 760D has a native sensitivity range of ISO 100-12,800, with an expansion setting of ISO 25,600 for when it's vital to get an image in low light. For movie shooting, the maximum native setting is ISO 6,400, and there's an expansion value of ISO 12,800.

When shooting through the viewfinder, the metering system uses a 7,560-pixel RGB and Infra Red (IR) metering sensor. These pixels are grouped into 63 segments (9x7) and the usual options of Evaluative,

Zooming in on the... Canon EOS 760D

Mode dial
This button needs to be pressed before the mode dial can be rotated, which seems rather fiddly at first.

LCD light button
This turns on the top-plate LCD light to allow the settings to be seen in low light .

Sensor
This detects when the 760D is held to your eye and turns off the main screen display.

Viewfinder
If the 760D detects flicker from lights, an icon tells you to use Anti-Flicker Shoot.

Q button
Pressing this button gives a quick route to changing some key settings.

Top LCD
The 760D displays when the Wi-Fi system is active in the top-plate LCD.

Partial (6.0% of viewfinder), Spot (3.5% of viewfinder) and Centre-weighted average metering are available. In Evaluative mode the metering is linked to the AF points, so the brightness of the subject could have an impact upon overall exposure Unlike the 700D's (iFCL) metering system, the pixels on the sensor each have their own RGB-IR filter and are read independently within the zone, which Canon claims gives more accuracy and better colour detection. In Live View and video mode the same metering options are available, but the camera uses the imaging sensor to supply the information and Evaluative mode uses 315 zones, Partial metering covers 10% of the scene and Spot 2.7%.

Canon has been pretty quick to appreciate the benefits brought by touchscreen technology. Like the 700D, the 760D has a 3-inch touch-sensitive Clear View II TFT screen with 1,040,000 dots and an aspect ratio of 3:2 to match the uncropped ratio of the imaging sensor precisely.

In another first for Canon SLRs, both cameras feature Wi-Fi and NFC (Near Field Communication) to enable them to be connected to other devices for remote control and image sharing. The NFC function provides a quick way of connecting them wirelessly to other NFC-enabled devices such as a smartphone, tablet, another camera or Canon's Connect Station CS100, the company's portable storage unit. Once enabled via the menu, two NFC devices are connected just by touching their NFC logos together. You can also control the cameras remotely via Wi-Fi using Canon's free app on a smartphone.

Meet the rivals...

The models the 760D is taking on

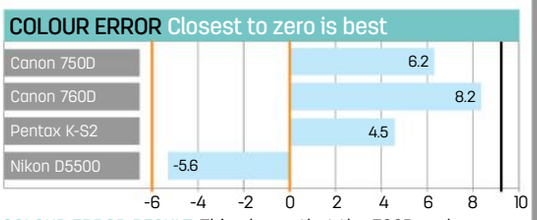
FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon 750D
£529 / $749 without lens
An alternative use of the 760D's processing engine, sensor, metering, white balance and AF system
Reviewed: page 16

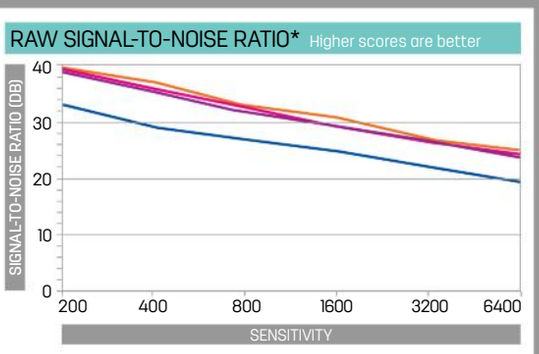
Nikon D5500
£579 / $600 without lens
The first Nikon SLR to have a touchscreen, this 24MP has no AA sensor filter for better detail resolution.
Reviewed: page 18

Pentax K-S2
£469 / $527 without lens
Like teh Canon and Nikon, this 20MP SLR has a vari-angle screen and Wi-Fi connectivity for sharing images.
Reviewed: Issue 165

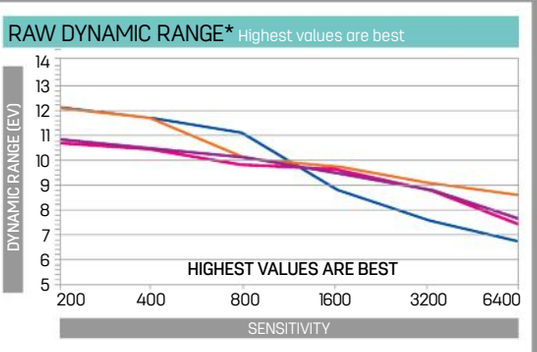
CSC BENCHMARKS
How does the Canon EOS 760D fare?



COLOUR ERROR RESULT: This shows that the 760D and 750D produce well saturated images. The Pentax K-S2 is the most accurate.



NOISE RESULT: The two Canons beat the D5500 for signal-to-noise ratio – which means that they produce cleaner images.

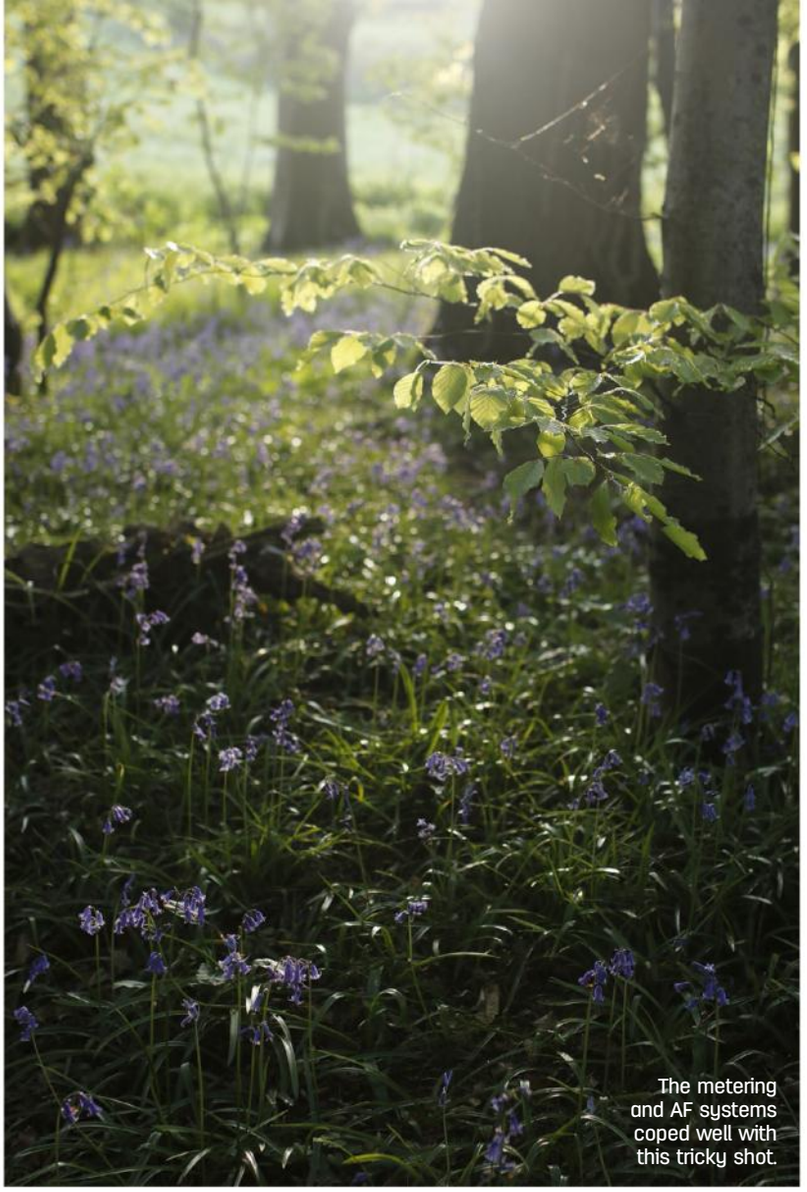


DYNAMIC RESULT: The 760D and 750D capture a wide good dynamic range, but they can't quite match the Pentax K-S2.

OVERALL BENCHMARK RESULT

Both the 760D and the 750D (see page 14) performed well in our tests, indicating that they capture lots of detail and control noise well. They also have consistent dynamic range across their sensitivity range, beating the D5500 at high values. But, in the lab at least, the Pentax K-S2 holds its own in this company.

* Raw results use images converted to TIFF



The metering and AF systems coped well with this tricky shot.

Build and handling

Although they have a different control layout, the 750D and 760D feel very similar in the hand. There's only 0.2mm difference in one dimension between them – the 760D is the slightly taller of the two. They don't have quite the solidity of the 5D Mark III, but they have a chassis that is constructed from aluminium alloy and polycarbonate resin with glass fibre and they feel pretty durable for entry-level models. There's no alarming creaking when you grip them tightly.

One of the biggest differences between the two cameras is that the 760D has a secondary (monochrome) LCD on the top-plate. This shows useful information such as the sensitivity, battery level, exposure level, shutter speed and aperture. It's useful to see the camera settings from above and uses less power than the main screen.

In another departure from the 750D, the 760D has a dial around the navigation buttons, with a lock to deactivate it. As on the 70D, this allows quick adjustments to exposure in manual exposure mode and exposure compensation in the automatic and semi-automatic modes, as there's no need to press a button while using the main dial.

The new dial feels lightweight in comparison with the larger dial found on the back of higher-end cameras like the 5D Mark III. It's also rather low down on the body, so it doesn't fall within the natural reach of your thumb: you have to stretch down to it. Nevertheless, it allows quicker adjustments to be made than is possible with the 700D or 750D.

Like the 7D Mark II but unlike the 750D, the 760D has an electronic level that can be shown in the

Stick or twist? Upgrade advice

Although the 760D and 750D replace the 700D (pictured), with the addition of the rear control dial and a top-plate LCD, the 760D is closer in handling to the Canon 70D. This may take some adjusting to, but it makes the camera quicker and easier to use. The addition of an electronic level is also useful for keeping horizons straight. Most importantly, the 760D can resolve a lot more detail than the 700D without detriment to image noise control, making it a great upgrade.

viewfinder or the main screen. This has a dedicated icon in the viewfinder and it doesn't use the AF points, so it can be seen when pressing the shutter release to focus the lens. However, it can be hard to see when the scene is dark and (unlike the 7D Mark II's) it only indicates horizontal tilt, not up/down tilt. This means that while it's useful for getting horizons straight, it can't help when you're trying to ensure that the sensor is parallel to a building to avoid converging verticals.

Above Both the new Canons could resolve the detail of these tomato stalks.

Performance

Probably the first question that everyone wants to be answered when they hear about the 750D and 760D is whether they produce the same image quality. Not surprisingly, the answer is yes. We saw an occasional exposure variation, but that can easily be explained by slight differences in framing (resulting from the different lens position) and the location of the active AF point. In other respects – colour noise control and detail – our tests reveal that the two cameras produce the same results.

The follow-up questions are usually "How much detail can they resolve?" and "What's the noise control like?" It's good news on both counts. The level of detail in images is a huge leap up from that from the 700D. Further good news is that the level of noise is about the same, or slightly better than in images from the 700D throughout the sensitivity range. That's despite the six-million hike in pixel count.

At 100% on-screen, high-sensitivity JPEGs from the 760D look softer than simultaneously captured raw files, but even at ISO 12,800 they look good at around A3 size. Raw files have more visible noise at 100%, but it's fine grained and there's no banding, so it's possible to produce images that have a bit more bite than the JPEGs.

While the Live View autofocus system is relatively speedy and can be used when hand-holding the camera to shoot stationary subjects, it's not quick enough to keep up with fast-moving subjects. This means it's best to compose sport and action images in the viewfinder and use the phase detection system, which is fast and accurate. We found this AF system does a pretty good job of selecting the right subject in 19-point mode, but Zone-AF and Single-point mode are a better bet if you can keep the active area over the subject.

The new metering system in the cameras is also very good, and it manages to produce good results, even in very tricky conditions when some cameras' metering would falter. Exposure is skewed towards that required by the subject under the active AF point, but it's usually balanced well across the frame. However, that doesn't mean you won't need to use the compensation control occasionally. Very bright sections of sky, for example, can sometimes trick them into underexposing shots.

Below Unlike the 750D, the 760D has a top-plate LCD.

Verdict

The 760D produces superb-quality images that can match Canon's top-end APS-C format camera, the EOS 7D Mark II, for detail. Noise is controlled well, and colour and exposure are excellent. While the secondary LCD is a useful bonus, it's the 760D's electronic level and the rear dial that really make the difference between it and the 750D in use. I think these features are worth the extra expense.

The main and Quick menus are well organised and the touch control is very well implemented, so you switch seamlessly between tapping or swiping the screen and using the control buttons and dials. It's a great camera for the money.

Angela Nicholson

WE SAY...

The 760D has the same superb image quality as the 750D, but its better handling, secondary LCD and electronic level make it our choice of the two models. It's almost like a smaller, lighter 70D.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★☆
IMAGE QUALITY	★★★★★
VALUE	★★★★☆
OVERALL	★★★★★

SLR www.canon.com

Canon EOS 80D £770/$1,100

Canon's new 80D looks great on paper, but does it deliver – and is it worth upgrading from the 70D?

SPECIFICATIONS

Sensor _ APS-C format with 24.2 million effective pixels
Focal length conversion _ 1.6x
Memory _ SD/SDHC/SDXC (UHS-1)
Viewfinder _ Optical covering 100%
Max video resolution _ Full HD (1920 x 10800
ISO range _ 100-16,000, expandable to 25,600
Autofocus points _ 45, all cross-type
Max burst rate _ 7fps
Screen _ Three-inch 1,040,000-dot Clear View II TFT
Shutter speeds _ 30-1/8,000sec, Bulb
Weight _ 650g (body only)
Dimensions _ 139 x 105 x 79mm
Power supply _ Lithium-ion LP-E6N

The 80D's screen is very good, but the viewfinder is still the most natural option for photographers to use when shooting stills

THE EOS 80D is aimed at dedicated enthusiast photographers, a demanding group of people who want to be able to shoot a huge range of subjects in a variety of conditions. Inside is a new 24-million-pixel sensor along with a Digic 6 processing engine; a combination that brings a native sensitivity range of ISO 100-16,000 (one-stop higher than the 70D) and a maximum expansion value of ISO 25,600 (the same as the 70D).

The maximum continuous shooting rate is the same as the 70D's at 7fps, but the burst depth has been increased to 110 JPEGs or 25 raw files when a UHS-1 SD card is used. That's a significant step up from the 65 JPEG or 16 raw files possible with the 70D.

Modern SLRs have two autofocus systems: one for when using the camera conventionally (in reflex mode), where images are composed in the viewfinder; and a second for use in Live View and video mode. Canon has improved both of these systems for the 80D in comparison with the 70D. The reflex mode system, for instance, has 45 AF points, all of which are cross-type, whereas the 70D has 19 points. It can also use colour information from the 7,560-pixel RGB+IR (infrared) metering sensor to help with subject tracking. This and the increased burst depth makes the 80D more attractive to keen sport and action photographers.

Turning to the Live View and video autofocus system, the 80D uses Dual Pixel CMOS AF technology like the 70D, which means it has phase detection points on the imaging sensor itself. The new system is more sensitive and faster than the one in the 70D, but because fast autofocusing often isn't desirable when you're shooting video, it's possible to vary the speed of the 80D's system over seven steps for slower focus changes.

1 An NFC chip means the 80D can connect to an NFC enabled smartphone or tablet with just a tap.

2 The vari-angle screen is the same as the Canon 70D's, but it provides a delightfully detailed view.

3 Canon has kept the 80D's shape and control layout the same as the 70D's.

4 A headphone port joins the mic port for audio monitoring and recording.

Build & handling

Canon gives touch-control over both the main and Quick Menus, and it can really speed up use. The Quick Menu is very useful, providing a

speedy route to some of the most commonly used features. It would be nice, however, if this was customisable so that it only contained the features you use on a frequent basis.

Although the 80D's screen is very good, the viewfinder is still the more natural option for most photographers to use when shooting stills, especially if the subject is moving. This also provides a bright view – and unlike the 70D's viewfinder, which only covers 98% of the lens field of view, the 80D's covers 100%. That means there are fewer surprises around the edge of the frame when you review your shots.

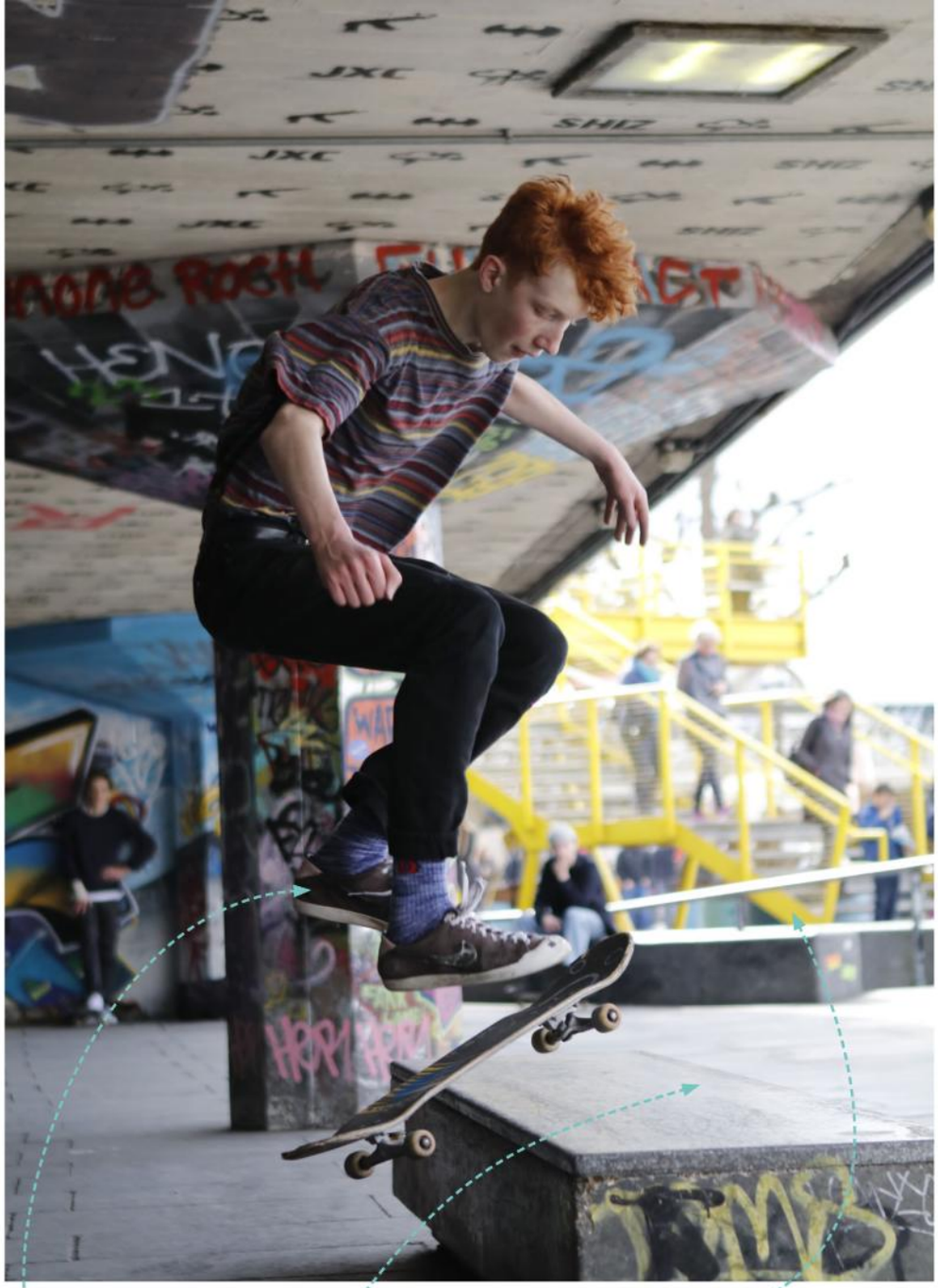
In an update on the 70D, it's possible to select the Creative Filter mode via the 80D's mode dial. When this is selected, one of 10 filter effects can be applied to JPEG images as they are shot. If you're shooting raw files or raw+JPEG files, the camera switches automatically to shooting just JPEGs. Although it's possible to use Creative Filters when composing images in the viewfinder, their impact can only be previewed on the main screen in Live View mode.

Performance

The 80D's 24.2MP sensor makes a 25% increase in pixel count over the 70D's, and it enables the new camera to make a significant step up in detail resolution for the majority of the sensitivity range without an increase in the level of noise. It's noticeable, however, that at ISO 12,800 the 80D scores lower in our resolution tests than the 70D. However, when the default levels of noise reduction are applied, images shot at this sensitivity setting (and at ISO 16,000) look good.

Noise is controlled well and although some detail is lost, there's no obvious smearing. We would advise caution with the uppermost setting of ISO 25,600, because some areas have a slight haze and lack detail when images are at around A4 size. But that's why this value is an expansion setting: Canon makes it available for use if it's really needed, but doesn't consider the image quality entirely satisfactory.

Canon has given the 80D a significantly better autofocus (AF)



1 **Fast AF**
In continuous autofocus mode, the 80D kept this skateboarder sharp easily as he moved across the frame and towards the camera.

2 **Dynamic range**
Thanks to the 80D's high dynamic range, there's detail in the bright highlights as well as the gloomy interior of this scene.

3 **It's natural**
The automatic white balance system coped with the different light and numerous colours of the scene to produce a natural image.

Meet the rivals...

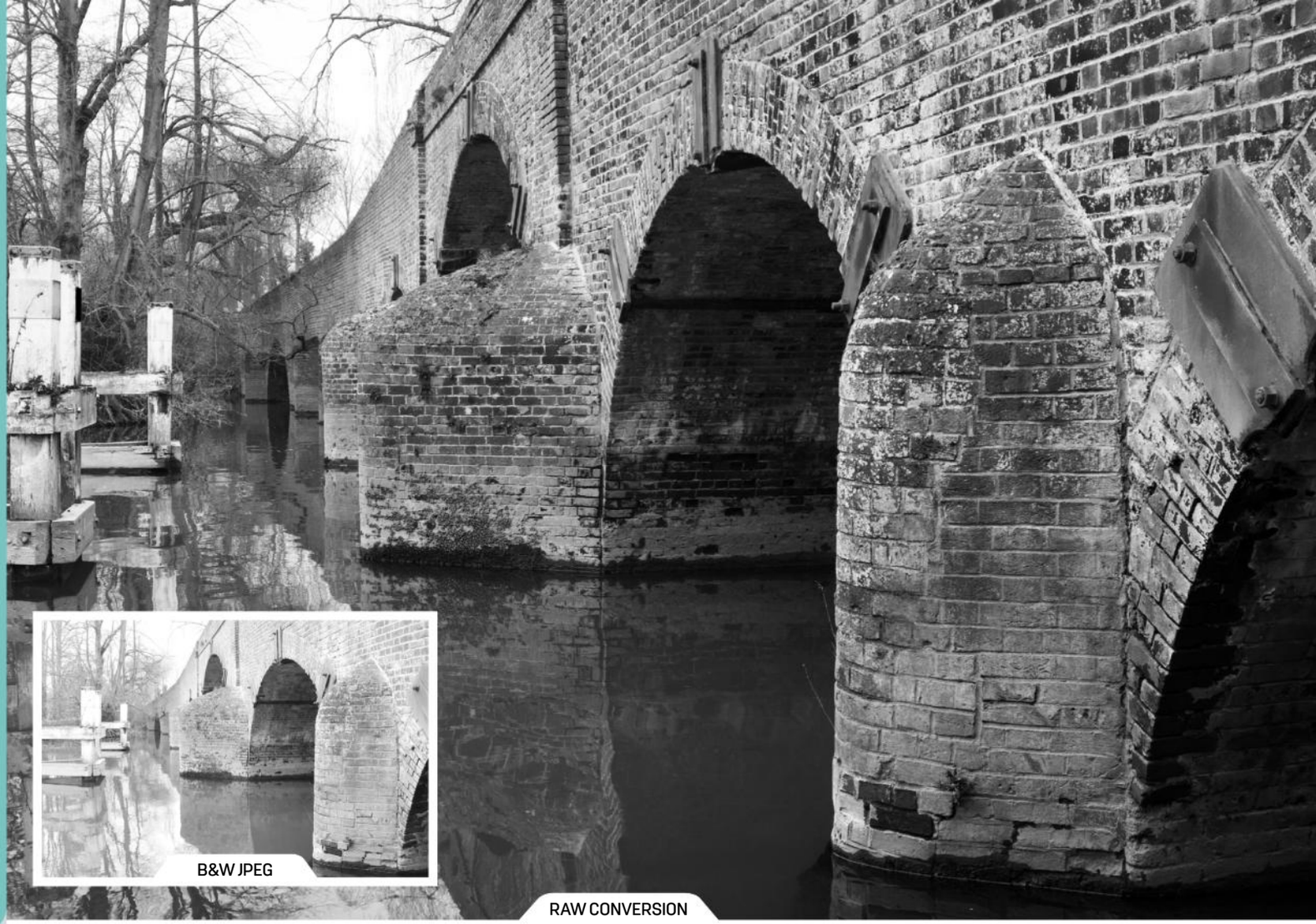
The cameras taking on the Canon 80D...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Nikon D7200
£714/$1,047
Like the K-3 II, this SLR's 24MP sensor lacks an optical low-pass filter, which helps it resolve a higher than average amount of detail.
Reviewed Issue 164
★★★★★

Pentax K-3 II
£709/$850
Pixel Shift Technology helps reduce noise from this 24MP SLR, but its impact isn't obvious with most shots at normal viewing sizes.
Reviewed Issue 170
★★★★½

Sony Alpha 77 II
£764/$1,198
This 24Mp SLT has an electronic viewfinder, along with an AF system that's fast and accurate even in low light.
Reviewed Issue 156
★★★★½



Above The Monochrome Picture Style gives a useful indicator, but the best results are created by converting a raw file.

Left Despite the very low light, the camera was able to focus, and noise is controlled well for ISO 16,000.

We found that the 45-point Automatic Selection option is pretty capable, probably aided by the new colour detection system

system for use with the viewfinder than the 70D, so I was keen to put it to the test. It didn't disappoint, getting stationary subjects sharp in a flash and keeping fast-moving subjects sharp, even in low light.

I experimented with the AF point selection modes when shooting skateboarders in the gloomy conditions of London's Undercroft skate park, and found that the 45-point Automatic Selection option is pretty capable, probably aided by the new colour detection system. Single-point AF (Manual selection) mode also worked well provided I could keep the active point over the subject. That's easier said than done when you're shooting skateboarders, who are prone to jumping, twisting and turning, and I had greater success when using the Zone AF mode.

In this mode, the 45 AF points are grouped into nine zones and you select the most appropriate zone to use before starting to shoot. The camera then tracks the subject using the AF points within that zone. It's a great option for moving targets and you see the points light up as they activate, giving you confidence that your images will be sharp. It's not 100% fool-proof but I got a high hit rate, and it's more reliable than 45-point Automatic Selection mode.

The Live View and Video mode AF system is also good. It's fast enough to shoot stills of moving subjects in some situations, but the viewfinder system is more reliable.

Above The articulating screen is really useful when you want to shot from low angles like this.

The Dual Pixel CMOS AF system's focus shift is smooth enough to be usable when shooting video, but it is dependent upon the shooting scenario and speed of movement.

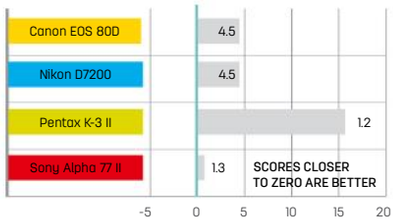
In reflex mode the 80D uses the same metering system as the 750D and 760D, which means there's a 7,560-pixel RGB+IR (infrared) sensor and 63-zone Evaluative, Partial, Centre-weighted and Spot metering options. The evaluative system is very good, but the weighting applied to the active AF point can mean you need to apply exposure compensation in high-contrast situations. There's nothing especially unusual in that.

When shooting in Live View mode, the 80D uses the imaging sensor to measure exposure, and it does a good job. However, if you've turned up the brightness of the screen to cope with bright ambient light, keep an eye on the histogram view: images may look brighter than they actually are.

Angela Nicholson

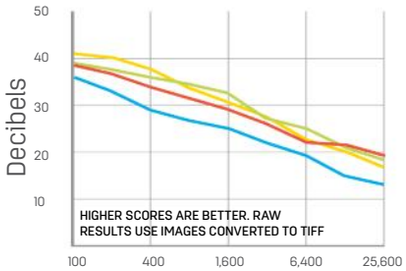
When shooting in Live View, the camera uses the imaging sensor to measure exposure

COLOUR ERROR



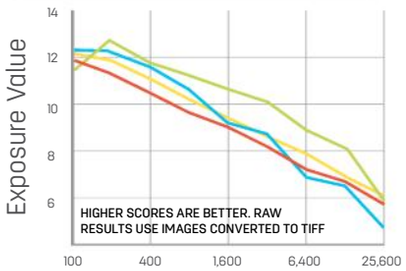
While colours aren't as saturated as in images from the Pentax K-3 II, the 80D's shots are a little more saturated than is technically correct. Still, they make for attractive results.

RAW SIGNAL-TO-NOISE RATIO



On the whole, the Canon 80D's images are a little cleaner than the 70D's. It only drops slightly behind the Pentax K-3 II and Sony Alpha 77 II at the top sensitivity values.

RAW DYNAMIC RANGE



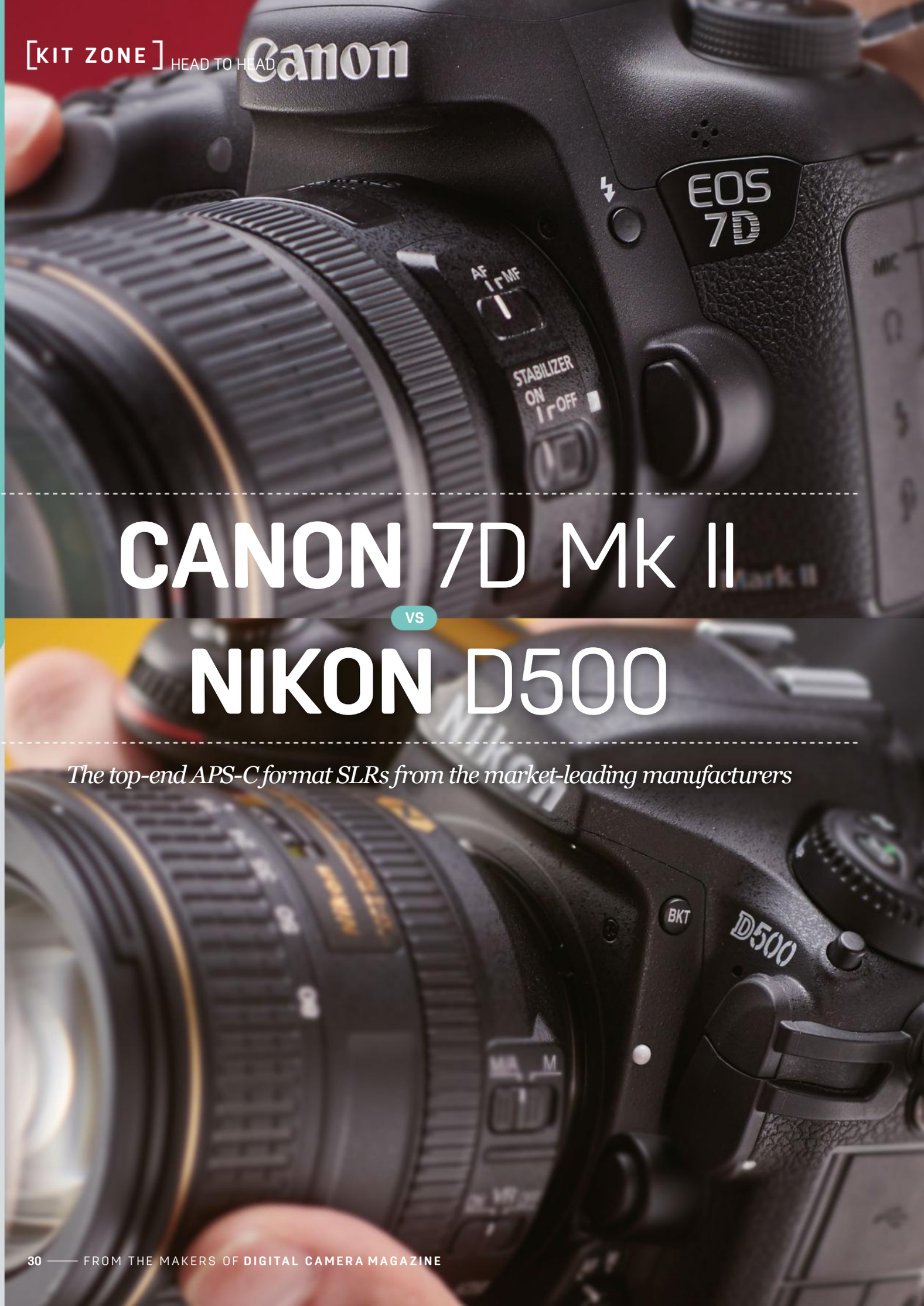
Canon has squeezed more dynamic range from the 80D than the 70D, indicating images have a better range of tones. However, the K-3 II achieves higher values.

WE SAY...

Canon has created an excellent camera that makes a worthwhile upgrade from the 70D. It's well-built with sensibly arranged controls, has good ergonomics and an extensive feature set, and can be set up to suit your shooting style. Most importantly, the image quality is superb with lots of detail.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★★½
OVERALL	★★★★½



CANON 7D Mk II

VS

NIKON D500

The top-end APS-C format SLRs from the market-leading manufacturers

FOR absolutely ages, Canon was the only company to offer a really high-end APS-C format SLR that was designed to appeal to dedicated enthusiast photographers, or to pros who wanted a lighter body with a smaller sensor to give their lenses extra reach. That's changed recently, however, with the introduction of the Nikon D500, which means that the Canon 7D Mark II now has a direct competitor. Our mission here is to see how they compare...

CANON EOS 7D Mk II

Website	www.canon.co.uk
Street price (body)	£1,200/$1,270
Image sensor	20.2MP CMOS
Sensor size	22.5 x 15.0mm APS-C (1.6x)
Max image size	5,472 x 3,648
Image processor	Digic 6
Low-pass filter	Yes
Lens mount	Canon EF-S
Viewfinder	Pentaprism, 1.0x, 100%
ISO range (expanded)	ISO 100-16,000 (51,200)
Autofocus points	65 (all cross-type)
Shutter speeds	1/8,000 to 30 sec, Bulb
Flash	Pop-up, hotshoe, PC terminal
Max burst rate	10fps
Image stabilisation	Via lens
Video – max resolution	1080p, 30/25/24fps
LCD screen	3-inch, 1,040k-dot, fixed Clear View II TFT LCD
Memory	CF (UDMA 7) and SD/SDHC/SDXC UHS-I
Wireless connectivity	N/A
Interface	USB 3.0, HDMI, mic, headphone
Body materials	Magnesium alloy
Body (W x H x D)	149 x 112 x 78mm
Weight	910g (body only)
Battery life (Cipa)	670 shots

NIKON D500

Website	www.nikon.co.uk
Street price (body)	£1,514/$1,897
Image sensor	20.9MP CMOS
Sensor size	23.5 x 15.7mm APS-C (1.5x)
Max image size	5,568 x 3,712
Image processor	Expeed 5
Low-pass filter	No
Lens mount	Nikon F DX
Viewfinder	Pentaprism, 1.0x, 100%
ISO range (expanded)	ISO 100-51,200 (1,640,000)
Autofocus points	153 (99 cross-type)
Shutter speeds	1/8,000 to 30 sec, Bulb
Flash	Hotshoe, PC terminal
Max burst rate	10fps
Image stabilisation	Via lens
Video – max resolution	4K UHD (3,840 x 2,160), 25/24fps
LCD screen	3.2-inch, 2,359k-dot touch-sensitive TFT LCD
Memory	XQD and SD/SDHC/SDXC UHS-II
Wireless connectivity	Wi-Fi + NFC + Bluetooth
Interface	USB 3.0, HDMI, mic, headphone
Body materials	Magnesium alloy
Body (W x Hx D)	147 x 115 x 81mm
Weight	760g (body only)
Battery life (Cipa)	1,240 shots

Features

Although the 7D Mark II dates from September 2014, it has a very similar pixel count to the recently launched D500; we're talking 20.2 million versus 20.9 million respectively. The D500 doesn't have an optical low-pass filter, which could give it a slight edge for detail resolution, albeit at enhanced risk of moire patterning.

Sports and action photography is important to the 7D Mark II and D500's target market. Accordingly, both cameras have high-spec autofocus systems with lots of AF points. Nikon has been especially generous in giving the D500 a 153-point system, although only 55 of them are individually selectable: the other 98 are support points. Of the 153 points, 99 are the more sensitive cross-type, and 15 of them function with lens and teleconverter combinations with maximum apertures as small as f/8. Of the 55 selectable points, 35 are cross-type, with nine sensitive down to f/8. Nikon claims the focusing system is sensitive down to -4EV.

Meanwhile, the Canon 7D Mark II has 65 AF points, which are all user-selectable and cross-type. The centre point is a more accurate dual-cross type when it's used with a lens that has a maximum aperture of f/2.8 or larger. With smaller aperture lenses from f/2.8 to f/8, it reverts to a cross-type sensor. The system is claimed to be sensitive down to -3EV.

All this indicates that while the 7D Mark II has more selectable points, the D500 has a more sensitive focusing system, with more AF points that function when teleconverters are used.

When continuous autofocus mode is selected, both cameras offer options that allow you to set a starting AF point and use the surrounding points to track the subject if it strays away from the initial point. On paper, Canon would seem to give more precision here, with the option to restrict the alternative AF points to just the four immediately adjacent to the selected point (giving a cross arrangement of five points); but Nikon's 25-point dynamic option actually only adds the four diagonally adjacent selectable points to create a 3x3 square of points, along with 16-non-selectable points that fall between. There are also Zone focusing options that give broad coverage when you only have a rough idea of where the subject will be in the frame, and an automatic selection option.

> A high shooting rate is useful when you're shooting sport. Despite its age, the 7D Mark II matches the Nikon D500 here

A high shooting rate is also useful when you're shooting sport. Despite its more advanced age, the 7D Mark II matches the D500 here, with both cameras able to shoot at up to 10 frames per second with full autofocus and metering functions. The D500 can shoot at this rate for up to 200 14-bit lossless compressed raw files, while the 7D II can only shoot 31 raw files. If you're willing to forgo raw files on the 7D II, you can shoot up to 1,090 JPEGs in a single burst. Swings and roundabouts spring to mind.

Low-light performance is a key area for the Nikon D500: it has a standard sensitivity range of ISO 100-51,200. There are also five expansion settings that give a maximum equivalent setting of ISO 1,640,000 – an incredibly high figure that beats all other APS-C format SLRs. In comparison, the 7D Mark II's >

CANON 7D Mk II

1 By default, this button is used to set the AF point selection mode.

2 The mode dial includes a Fully Automated shooting option as well as three custom options.

3 This button releases the pop-up flash. The D500 doesn't have a built-in flash.

4 An infra-red receiver is built into the grip to enable remote-control operation.

5 This customisable lever can change the purpose of the main dial – setting sensitivity, for example.

6 Using this to rate your images makes shots easier to find after downloading.

NIKON D500

1 The Move record button is located on the top of the D500 rather than on the back, like on the 7D II.

2 This lock button must be pressed before the drive mode can be changed.

3 This switch-and-button arrangement makes changing the focus mode easy when using the viewfinder.

4 This buttons is customisable and useful for activating features like the Level.

5 While the 7D Mk II takes CF and SD/SDHC/SDXC cards, the D500 takes XQD and SD/SDHC/SDXC media.

6 Flick this switch to flip between stills and video Live View mode.

native sensitivity range is ISO 100 to 16,000. The two expansion settings give a maximum value of ISO 51,200 – the D500's top native setting.

It's possible to shoot Full HD video with both cameras, but only the D500 has 4K capability. That's a major plus for the Nikon camera – but focusing in Video or Live View modes relies solely on contrast detection, whereas the Canon camera has faster Dual-Pixel AF technology, which incorporates phase-detection focusing.

One disappointment with the 7D Mark II is that it doesn't have Wi-Fi connectivity built-in. (There is a GPS unit, though.) Nikon, however, used the D500 to introduce SnapBridge, a Wi-Fi system that uses low-power Bluetooth communication to maintain a connection between a paired camera and a smart device at all times. It can also be set to allow 2MP images to be transferred automatically to the photo or tablet – even if the camera is turned off. There's only an Android app available, although the iOS version should have been released since we went to press.

Build and handling

The two cameras aren't a million miles apart in terms of size and shape, but the D500 is just a shade beefier-looking. A glance at the spec sheets confirms that it is 150g lighter. This weight difference doesn't reflect in the feel of the camera: it seems every bit as tough as the 7D Mark II. Both models have weatherproof and dustproof seals.

The control layouts follow the familiar Canon and Nikon patterns. The 7D Mark II has a dedicated mode dial on the left of the top-plate, and the D500 has a button that must be used in conjunction with the rear Command Dial to set the exposure mode. The D500 has a dial for setting the drive mode on the left of the top-plate while the 7D Mark II uses a button along with the Quick Control Dial to set the same feature.

A key difference between the two cameras is that while the 7D II's screen is fixed, the D500's screen is mounted on a tilting bracket, which enables it to be tipped up or down for easier viewing when shooting landscape-format images from below or above head-height. It's especially useful to videographers, who need to use the screen for composing scenes. The bracket is nice and solid, and seems set to work well for a long time.

At 3.2 inches, the D500's screen is also 0.2 inches bigger across the diagonal than the 7D Mark II's. Perhaps more significant to the handling, however, is the fact that the D500's screen is touch-sensitive. Unfortunately it's not possible to use it to select settings or navigate the menu with taps on the screen, but it's very useful for setting the AF point when you're shooting in Live View or Video mode. You can also scroll through images with a swipe and zoom in with a double-tap to check sharpness.

Sticking with the screen, with 2,359,000 dots rather than 1,040,000 dots, the Nikon monitor provides a sharper, more detailed view than the

Although the two cameras have a similar pixel count, the D500 is able to resolve just a little more detail

Canon screen. This is especially noticeable when you zoom in to check focus and sharpness.

As you might expect, the viewfinders provide a similar view; both are large and bright. When you're shooting, you'll spot that the Nikon camera's AF points extend slightly further towards the edges of the frame. It's most noticeable in the vertical distribution.

Both cameras have a dedicated control for setting the AF point. With the 7D Mark II, you have to press a button before the focus point can be changed via the joystick-like controller, but there's an option in the menu that allows you to do it directly. There are a couple of frustrations with the Canon control, however. You need to half-press the shutter release to wake the AF system and enable the point to be moved; you then have to nudge and release repeatedly to move from point to point – you can't just push and hold the stick to jump through several points. Nikon has got these two issues cracked, on the other hand.

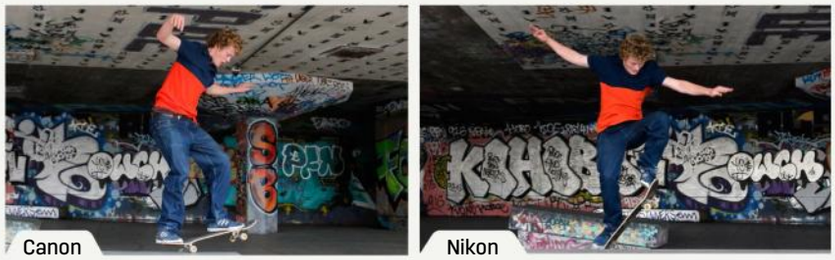
Performance

Our resolution chart results make interesting viewing. Although the two cameras have a similar pixel count, the D500 is able to resolve just a little more detail throughout much of the sensitivity range. It doesn't consistently beat the 7D Mark II, but it has a slight edge that we can attribute to the lack of an optical low-pass filter.

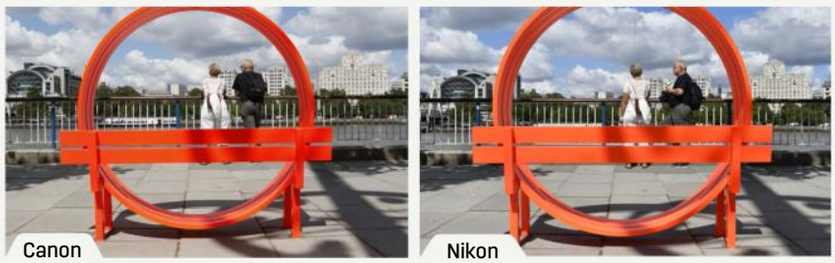
Examining images taken throughout the sensitivity range reveals that noise levels from the two cameras are very similar, even at the 7D Mark II's top expansion setting (ISO 51,200). This suggests that, rather than making a major breakthrough with noise control, Nikon has pushed the boundaries to allow photographers to make their own decisions about what is acceptable image quality in any given shooting situation. Indeed, the D500's uppermost settings produce terrible results: in low light you'll struggle to recognise the subject at Hi 5 (ISO 1,640,000).

The Canon 7D Mark II's autofocus system is very good: it gets moving subjects sharp quickly and can keep them in focus in many situations. The D500's is just a shade nippier, though, and needs very little contrast to >

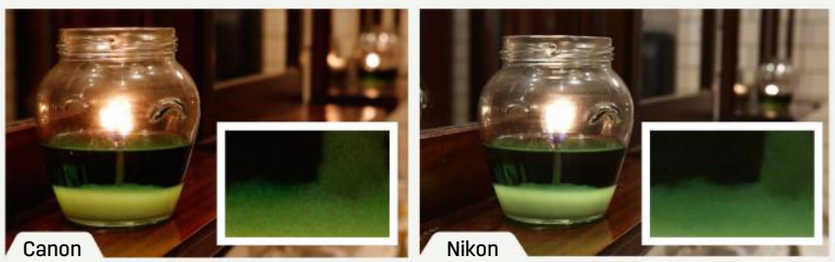
IMAGE TEST



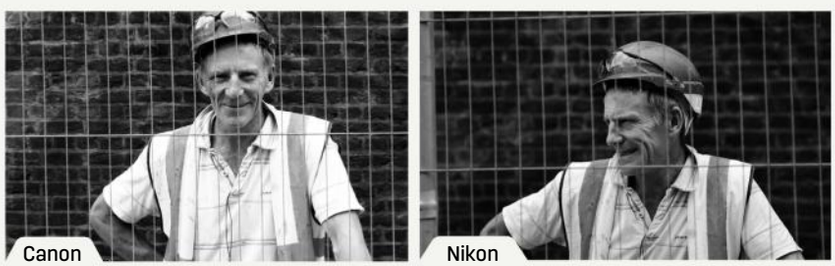
Autofocus — While the Canon 7D Mark II's autofocus system is extremely capable, the D500's is a little faster and does a really superb job of tracking fast-moving subjects.



Exposure — Neither camera struggled with the exposure of this bright, colourful scene, but the Nikon D500 has reproduced the reds more accurately in its default settings.



Noise — Noise isn't really an issue for either camera at settings such as ISO 6,400: these images have good detail and only a faint texture visible at 100%.



Monochrome — If you turn the contrast up to maximum, you can get some nice black-and-white images in-camera. The detail in these shots is also impressive.

You can get away with autofocusing while shooting video with the 7D Mark II – but you really can't with the Nikon D500

operate. It also latches onto subjects quicker, and I found I got a slightly higher hit rate with it.

Switch to Live View or Video mode, however, and the 7D Mark II's Dual Pixel AF technology comes into play, resulting in much smoother, faster AF adjustment than the D500's contrast-detection system can manage. While experienced videographers will still focus manually, you can get away with autofocusing while shooting video with the 7D II – but you really can't with the D500.

When using the general-purpose Evaluative (Canon) and Matrix (Nikon) metering systems during this test, there were a few occasions when a little exposure compensation was required, sometimes by one camera, sometimes by both. It was never excessive with either camera, although the D500 copes especially well with bright subjects.

The D500's auto white balance system tends to produce neutral to cold results, while the 7D Mark II's errs more on the side of warmth. Neither is objectionable and there's little in it, but when viewed alongside each other, I suspect most people may prefer the Canon results.

Angela Nicholson

CANON EOS 7D MARK II

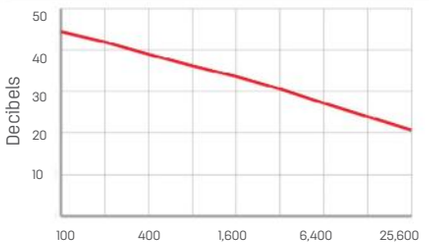
NIKON D500

COLOUR ERROR CLOSER TO ZERO IS BETTER

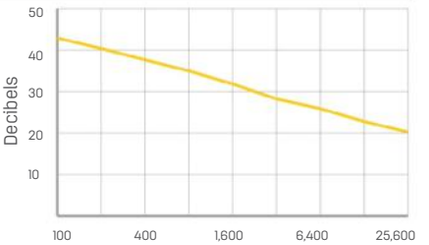
This score indicates that the 7D Mark II produces warmer, more saturated images than the D500.

This result is close to perfect, but colours can look a little flat in the default settings.

RAW* SIGNAL-TO-NOISE RATIO HIGHER IS BETTER; RAW RESULTS USE IMAGES CONVERTED FROM TIFF

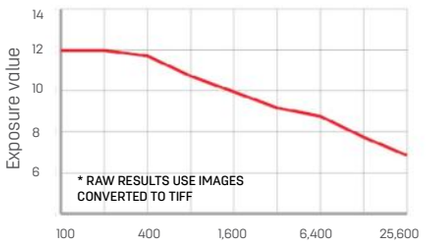


It's very close, but the 7D Mark II just beats the D500 for its whole ISO range.

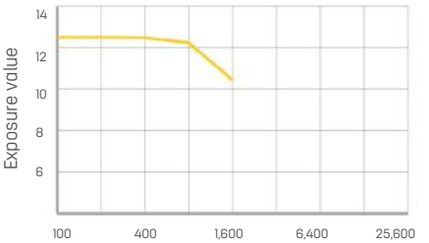


In real-world shooting situations, the two cameras capture a similar level of noise.

RAW* DYNAMIC RANGE HIGHER IS BETTER; RAW RESULTS USE IMAGES CONVERTED FROM TIFF



The 7D Mark II certainly captures a good range of tones, but it can't match the D500.



Dynamic range is over 12EV from ISO 50 to 800 and is maintained well to ISO 51,200. (Not shown.)

☐ Normal ISO range ☐ Expanded ISO range

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★★☆
VALUE	★★★★☆
OVERALL	★★★★☆

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★½

THE Canon 7D Mark II is an excellent camera that has stood the test of time very well, and its image quality is a near match to that of the Nikon D500. However, the D500 benefits from a little finessing that has been brought about by recent developments. The autofocusing system is absolutely superb, and the whole camera just seems a little more responsive than its Canon counterpart. The new SnapBridge technology is a boon to anyone who likes to share images on a frequent basis, because it saves you from having to remake the connection with your phone.

It's a shame that Nikon hasn't put some effort into improving the Live View and Video autofocus system for the D500, because the tilting touch-sensitive screen are a great partnership for the 4K video recording capability.

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CANON EOS 6D

VS

NIKON D750

Matthew Richards pits two top-selling SLRs against each other

WANT the very best enthusiast-level digital SLR without blowing your budget on a fully professional body? There are two main contenders–the Canon EOS 6D and the Nikon D750. Canon and Nikon's range of 'professional' digital SLRs kick off with the 5D Mk III and D810, both of which cost roughly £1,000/$1,000 more than their range-topping consumer-class cameras.

The Canon 6D feels like it's been around for yonks, having been announced back in September 2012. The Nikon D750 is two years newer and fresher, and outguns the Canon for features and specifications. It has a newly designed image sensor and the same Expeed 4 image processor as the very latest D810A and D7200. By contrast, the 6D looks a bit of a poor relation, especially compared with Canon's latest APS-C format camera, the 7D Mk II, which boasts a newer generation of processor and a more sophisticated autofocus system.

Even so, the majority of enthusiast photographers will still prefer to go full-frame, for its greater creative control over depth of field and wider choice of top-grade lenses. So let's see how the well-established 6D holds out against Nikon's D750 scene-stealer.

CANON EOS 6D

Website	www.canon.co.uk
Street price (body)	£1,200/$1,270
Image sensor	20.2MP CMOS
Max image size	5,472 x 3,648
Image processor	Digic 5+
Low-pass filter	Yes
Lens mount	Canon EF
Viewfinder	Pentaprism, 0.71x, 97%
ISO range (expanded)	ISO 100-25,600 (50-102,400)
Autofocus points	11-point (1 cross-type)
Shutter speeds	1/4,000 to 30 sec, Bulb
X-sync	1/180 sec
Max burst rate	4.5fps
Buffer capacity (raw)	17 shots
Video – max resolution	1080p, 25/30fps
LCD screen	3.0-inch, 1,040k, fixed
Memory	1 x SD/SDHC/SDXC UHS-1
Wireless connectivity	Wi-Fi & GPS
Interface	USB 2.0, HDMI
Body materials	Alloy & polycarbonate
Body (W x Hx D)	145 x 111 x 71mm
Weight	755g
Battery life (Cipa)	1,090 shots

NIKON D750

Website	www.nikon.co.uk
Street price (body)	£1,514/$1,400
Image sensor	24.3MP CMOS
Max image size	6,016 x 4,016
Image processor	Expeed 4
Low-pass filter	Yes
Lens mount	Nikon F
Viewfinder	Pentaprism, 0.7x, 100%
ISO range (expanded)	ISO 100-12,800 (50-51,200)
Autofocus points	51-point (15 cross-type)
Shutter speeds	1/4,000 to 30 sec, Bulb
X-sync	1/200 sec
Max burst rate	6.5fps
Buffer capacity (raw)	15-33 shots
Video – max resolution	1080p, 50/60fps
LCD screen	3.2-inch, 1,229k, tilt
Memory	2 x SD/SDHC/SDXC UHS-1
Wireless connectivity	Wi-Fi
Interface	USB 2.0, HDMI
Body materials	Alloy & polycarbonate
Body (W x H x D)	141 x 113 x 78mm
Weight	840g
Battery life (Cipa)	1,230 shots

Features

Rightly or wrongly, many of us check out the megapixel count before anything else when we eye up a prospective new camera. The 6D has a somewhat modest 20.2MP sensor, whereas Nikon takes an early lead with its 24.3MP sensor. Nikon claims that its new design delivers "exceptional" image quality that's cleaner than ever before at high ISO settings. Even so, the 6D stretches a full f/stop further than the D750 in its native and expanded sensitivity ranges, to ISO 25,600 and 102,400 respectively.

A little curiosity is that the D750 bucks Nikon's trend with its other recent digital SLRs and retains an OLPF (Optical Low-Pass Filter) in front of its image sensor. This comes with an anti-alias filter to guard against moiré patterning and false colour. This is the usual Canon stance, and the 6D also has an OLPF.

The D750 looks the sportier camera of the two, with a 6.5fps maximum drive rate. That's two whole frames per second faster than the 6D can muster. And where the 6D has sufficient buffer capacity for 17 shots in raw mode, the D750 can stretch to 33 shots. However, you can only squeeze that many raw shots into the buffer if you switch to 12-bit compressed mode. In 14-bit uncompressed raw mode, there's only enough space for 15 shots. At least Nikon gives you choices over bit-depth and compression settings, unlike Canon.

> Both the 6D and D750 feature bright and sharp pentaprism viewfinders rather than cheaper pentamirror units

Tracking action should be another sporty win to the D750, as it features a new-generation 51-point autofocus module. This includes 15 cross-type points for resolving detail in both horizontal and vertical planes, as well as enabling 11 points to be used where your widest available aperture is only f/8. It comes into its own if you need to add a 2x tele-converter to an f/4 telephoto lens. By comparison, the 6D is a real under-achiever in the autofocus stakes. It has a mere 11 AF points in total, with just a single cross-type point at the centre, and none of them can function at apertures narrower than f/5.6.

Both the 6D and D750 feature bright and sharp pentaprism viewfinders rather than cheaper pentamirror units. However, the 6D's viewfinder only gives 97% frame coverage, whereas the D750 shows you the whole picture. The 6D lacks the 'intelligent' viewfinder display options that are available in many of Canon's newer SLRs, including the 70D and 7D Mk II APS-C format cameras.

Up above the viewfinder, the D750 adds a pop-up flash which is omitted in the 6D's design. You could argue that photographers at this level are unlikely to use a pop-up flash, but it can be useful for the emergency filling of shadows, as well as for wirelessly triggering off-camera >

[HEAD TO HEAD] CANON 6D VS NIKON D750

CANON EOS 6D

1 AF, Drive, ISO and Metering mode buttons are lined up along the front of the top-panel info LCD.

2 The 6D includes 'Creative Auto' and scene modes as well as a full auto setting.

3 The viewfinder housing doesn't include a pop-up flash module, and there's no built-in AF assist lamp either.

4 There's only one control button on the front, which is for depth of field preview.

5 The pentaprism viewfinder only gives 97 per cent frame coverage and crops the extreme edges.

6 The 6D's screen has a lower pixel count and no tilt facility.

NIKON D750

1 As well as plentiful scene modes, the D750 adds an Effects setting with options like night vision and colour sketch.

2 The drive mode wheel under the shooting mode dial is simpler than the 6D's arrangement.

3 The pop-up flash, absent on the 6D, is worth having even if only for easy wireless control of external flashguns.

4 Front-mounted controls include a depth of field preview and an autofocus mode selector.

5 An additional row of control buttons down the left-hand side enable quick access to shooting and playback options.

6 The tilting LCD screen comes in handy for Live View and movies.

flashguns that are compatible with Nikon's wireless master/slave flash modes.

Around the back, the D750 boasts a slightly larger and higher-resolution LCD screen than the 6D. The Nikon also adds a tilt facility that's missing on the Canon. It's not fully articulated and, unlike in some current cameras, the range of tilt doesn't extend to flipping the screen over completely for selfie mode shooting. Even so, it's a bonus for high-level or low-level Live View and movie shooting. The D750 also includes two SD slots rather than the 6Ds's one. The extra slot is useful for instantly creating backups of your images while shooting, or for saving raw and JPEG files to separate cards. Both cameras are compatible with SDHC and SDXC cards, and are able to make use of the performance increase offered by the UHS-1 (Ultra High Speed) bus.

The Nikon can capture 1080p movies at maximum frame rates of 50 or 60 frames per second rather than the Canon's 25 or 30fps, but neither camera is capable of 4K video capture. Both have built-in Wi-Fi connectivity, and the only notable feature that's included in the 6D but lacking in the D750 is built-in GPS for geo-tagging images.

Build and handling

The build quality of the two cameras feels very similar in most respects. Both use a mix of reinforced polycarbonate and magnesium alloy sections. The Nikon has alloy sections at the top and rear, with a polycarbonate front panel, whereas the Canon has alloy front and rear panels and polycarbonate up on top. Both feature weather-seals.

The 6D and D750 make great everyday walkabout and travel cameras, with compact dimensions for full-frame SLRs. They're noticeably smaller than the Canon 5D Mk III and Nikon D810, and nowhere near as big as the top-flight 1D X and D4S models with their built-in vertical grips. The 6D is marginally smaller the D750 and somewhat lighter at 755g compared with 840g. The D750 has better stamina, with 1,230 shots from a freshly-charged battery rather than the 6D's 1,090 shots (Cipa-tested).

Both of these SLRs have conventional shooting mode dials that include a Scene position for access to various scene modes, as well as a fully automatic shooting mode that has intelligent real-time scene analysis. The Nikon goes a step further with an Effects position on the shooting mode dial, for applying special imaging effects while shooting, whereas the Canon adds a more serious and enthusiast-friendly Bulb mode. Both cameras add two user-defined positions on the shooting mode dial for quick access to preferred set-ups.

Further similarities in handling include a top-panel info LCD for showing important shooting settings and various other parameters like battery status. In front of this LCD, the Canon has a bank of buttons for accessing AF mode, drive mode, ISO and metering mode. The Nikon only has a metering mode button in front of the top screen, other functions being dispersed to buttons and dials at

The 6D and D750 make great everyday walkabout and travel cameras, with compact dimensions for full-frame SLRs

other positions around the camera. The Nikon also adds an exposure compensation button just behind the shutter release-button. We prefer this to the Canon's rear-mounted rotary dial for exposure compensation, which is easy to adjust accidentally unless you engage the adjacent locking switch.

The now ubiquitous Quick or Info menu is available on both cameras, for quick and easy control over shooting settings via a specialist on-screen menu on the rear LCD. Both are pretty slick and well thought out, although Canon wins out for intuitive design. Overall, the layout of controls and general handling of the 6D and D750 are typical of Canon and Nikon designs respectively, and will feel immediately familiar to photographers accustomed to either brand.

Performance

With equivalent high-quality lenses that have fast ring-type ultrasonic autofocus, there's practically no difference in the speed with which the two competing cameras can lock onto stationery objects. At least, that's the case when using the central AF point, which is equally effective in both cameras even in very low lighting conditions. However, the D750 is more competent than the 6D at autofocusing with off-centre AF points, and it's better at tracking moving objects in continuous autofocus mode. Nikon's advanced, 3D-tracking AF mode is particularly good for this.

Both cameras have consistent metering, although the 6D tends to give marginally brighter images in centre-weighted metering mode. In evaluative or matrix metering mode, the 6D biases results more exclusively to brightness levels at the AF point (or points) that achieve autofocus, whereas the D750's value judgments are based more on the whole scene. The D750 is more safety-conscious in its efforts to avoid blown highlights when using matrix metering.

For colour rendition, the Canon's images are typically a little warmer whereas the Nikon often tends to pump up saturation a little more and adds a little extra punch and vibrancy. This >

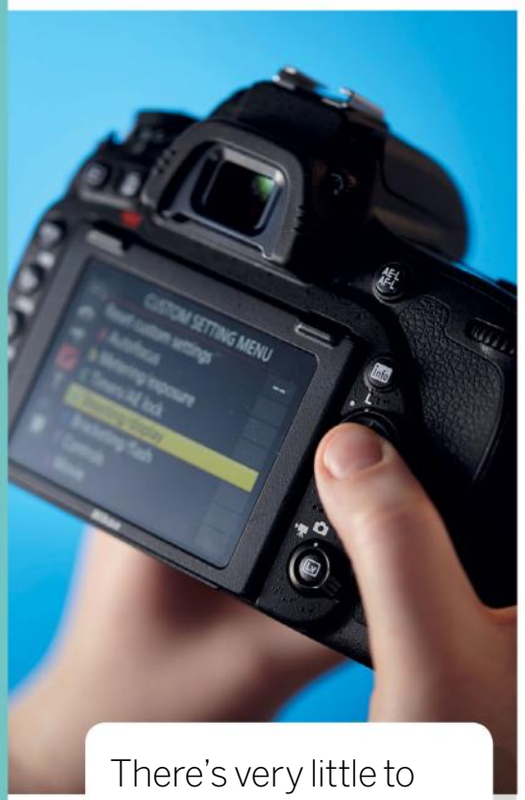
IMAGE TEST

Outdoor — For outdoor and landscape shots using auto white balance, the D750 tends to give a slightly cooler colour balance than the 6D. The Nikon's images are more vibrant with greater contrast.

Detail — The Nikon performs better in capturing fine detail. It makes the most of its sensor's higher megapixel count and stays slightly ahead of the Canon throughout the sensitivity range.

Dynamic range — This shot with bright highlights and deep shadows shows the D750 gives higher-contrast results. Highlights are well preserved in both, but the Canon retains more lowlights.

Low light — There's practically nothing to choose in the clean and noise-free quality of these lowlight images, which both retain high levels of detail. They were taken well after sunset at ISO 12,800.



There's very little to choose between the two cameras for dynamic range at the base sensitivity setting of ISO 100

arguably makes the 6D a little more flattering for portraits, and the D750 a bit more dramatic for landscapes.

There's very little to choose between the two for dynamic range at the base sensitivity setting of ISO 100. However, from ISO 200 and upwards, the 6D gives better detail in lowlights, and more convincing tonal range. This remains the case whether the Canon's Auto Lighting Optimizer and Nikon's Active D-Lighting features are enabled or switched off.

The D750 improves on the older Nikon D610 and easily outclasses the D810 for delivering clean, noise-free images at high ISO settings. Low-light, low-noise imagery has recently been a Canon strong point but the D750 proves every bit as good as the 6D at producing clean images with impressive fine detail. Results are superb even at super-high sensitivity settings of ISO 6,400 and 12,800, although the Canon is slightly better at the top of its native sensitivity range of ISO 25,600, at which point the Nikon is already in its expanded range.

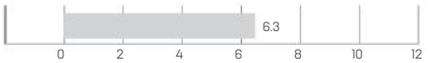
Matthew Richards

Digital Camera ★★★★★ BEST ON TEST

CANON EOS 6D

NIKON D750

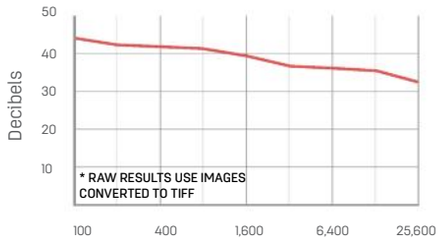
COLOUR ERROR CLOSER TO ZERO IS BETTER



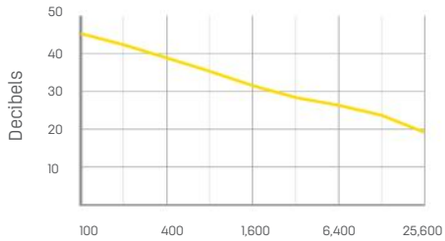
Technically, the score for colour accuracy isn't great, but there's an attractive warmth to the 6D's images.

Near-perfect colour rendition in the lab, but the auto white balance system produces cool shots outdoors.

RAW* SIGNAL-TO-NOISE RATIO HIGHER IS BETTER; RAW RESULTS USE IMAGES CONVERTED FROM TIFF

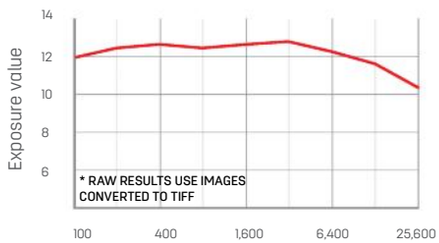


Signal-to-noise ratio scores are better than from the D750, but the Nikon draws closer in JPEG quality.

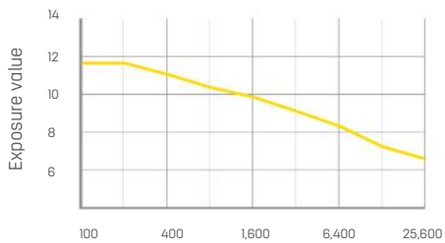


The D750's images look equally detailed and noise-free, before and after conversion.

RAW* DYNAMIC RANGE HIGHER IS BETTER; RAW RESULTS USE IMAGES CONVERTED FROM TIFF



The 6D maintains astonishingly rich highlight and low-light detail, even at ultra-high ISO settings.



The D750loses more low-light detail than the 6D and is more likely to blow highlights at high ISO settings.

VERDICT

	6D	D750
FEATURES	★★★☆☆	★★★★☆
BUILD & HANDLING	★★★★☆	★★★★½
PERFORMANCE	★★★★½	★★★★½
VALUE	★★★★½	★★★★½
OVERALL	★★★★☆	★★★★½

THE Canon 6D and Nikon D750 are both excellent cameras, ideally suited to expert and enthusiast photographers. The D750 reaches out a little more to beginners with its additional Effects modes. Both cameras strike a great balance between size and natural handling: the 6D has a more intuitive Quick menu, whereas the D750 adds a tilting rear screen.

For overall features and specifications, the D750 is a clear winner over the 6D. As for performance, both cameras have strengths and weaknesses. The Nikon delivers punchier-looking images and has better autofocus, especially for moving objects. The Canon has better dynamic range and is more able to retain detail in bright highlights and dark lowlights.

Both cameras also give stunning low-light performance, delivering amazingly clean images even at super-high sensitivity settings. All things considered, however, the Nikon D750 is the better camera, and well worth its higher asking price.

SLING STRAPS

Strap in and discover the most comfortable and convenient ways to carry your camera

www.blackrapid.com

BlackRapid Sport Breathe

£79/$82

This updated Sport strap now has breathable foam to keep you cool, while an extra-wide pad and under-arm strap ensure top comfort. A super-smooth slide action seals the deal.

OVERALL ★★★★★

www.bgrip.com

CP Tech B-Glider

£32/$50

The B-Glider's soft, supple strap feels great, and it'll clip to a backpack. Camera attachment and release is easy, although the mounting plate is bulky and the slide action isn't the smoothest.

OVERALL ★★★★½

kaiser-fototechnik.de/en

Kaiser Action Strap

£40/$52

Kaiser's contender is almost identical to Matin's design (below), with the same soft shoulder pad and pivoting joints. It edges ahead thanks to smoother strap material that enables slicker sliding.

OVERALL ★★★★★

www.cameraclean.co.uk

Matin Neoprene Fast-Access Strap 5

£43/$47

There's a lot to like here, with superbly supple padding and swivel joints that further up the ergonomics. Camera attachment is tool-free, and a secure clip links the strap to the mount.

OVERALL ★★★★½

www.optechusa.com

OpTech Utility Strap Sling

£16/$30

This budget buy feels comfortable and secure, and it attaches to a camera strap loop rather than to the tripod mount. Sliding could be smoother, however, and some elements feel cheap.

OVERALL ★★★☆☆

www.peakdesign.com

Peak Design Slide

£49/$60

A sling, shoulder strap and neck strap in one, the Slide exudes quality with a seatbelt-style strap and premium fittings. A dedicated sling feels more secure, but the Slide takes the style win.

OVERALL ★★★★½

SLR www.canon.co.uk

Canon EOS 5D Mark IV

£3,600/$3,500

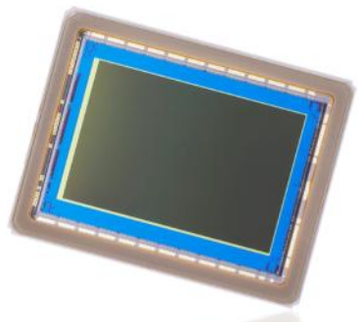
Canon's pro all-rounder gets a big boost in features

SPECIFICATIONS

Sensor _ 36 x 24mm 30.4MP CMOS
Focal length conversion _ 1x (full-frame)
Memory _ One CompactFlash; one SD/SDHC/SDXC (UHS-I)
Viewfinder _ Optical pentaprism with approx 100% coverage
Max video resolution _ 4K (4,096 x 2,160) at 30fps
ISO range _ 100-32,000 (50-102,400 expansion)
Autofocus points _ 61 points. Max of 41 cross-type AF points inc 5 dual cross-type at f/2.8 and 21 cross-type AF points at f/8. The number of cross-type AF points will differ depending on the lens
Max burst rate _ 7fps
Screen _ 3.2in Clear View II touchscreen LCD; approx 1,620,000 dots
Shutter speeds _ 30-1/8,000 sec plus Bulb
Weight _ 890g
Dimensions _ 151 x 116 x 76mm
Power supply _ LP-E6N rechargeable lithium-ion battery

CANON'S 5D series has a rich heritage – the original EOS 5D camera bought full-frame photography to the masses – so the arrival of a new generation of the 5D is a big deal. The 22.3MP sensor in the 5D Mark III was starting to look a little dated compared to some of the competition, so it's nice to see a notable jump to 30.4MP here.

That's not quite rivalling the 36.3MP Nikon D810 or the 42MP Sony Alpha 7R II; but files still come out at 6,720 x 4,480 pixels. This means that if you want to print at 300dpi, the native size is just under A2 at 56.9 x 37.9cm (22.4 x 14.9 inches). Those looking for even more pixels already have the option of the 50.6MP 5DS.



Right The 5D Mark IV's image sensor provides good noise performance and a significant increase in resolution.

1 With HDMI, USB and audio ports on the side of the camera, Canon has moved the remote trigger socket to the front.

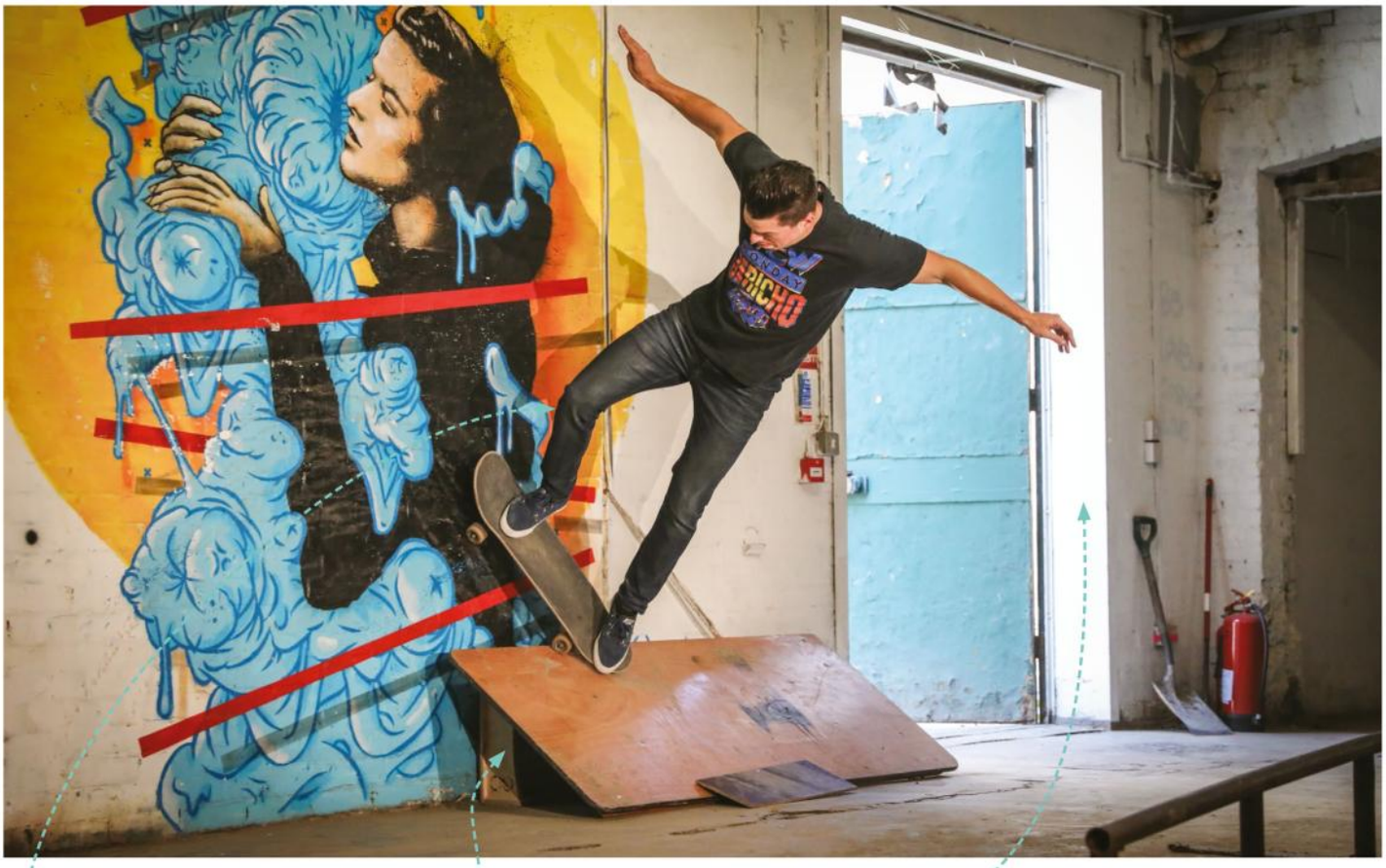
2 Not only does the 3.2-inch LCD screen get a useful resolution boost to 1,620,000 dots, it also boasts full touch control.

3 This new button can directly change AF area, or it'll adjust other settings when used in conjunction with the front command dial.

Features

The 5D Mark IV uses the same latest-generation sensor technology that we've seen in both the 1D X Mark II and 80D. Canon says this sensor's on-chip digital-to-analogue conversion delivers improved noise performance and dynamic range. The use of Dual Pixel Raw technology gives you the capacity to fine-tune the area of maximum sharpness during post-production (only using Canon's own DPP software at present).

The Mk IV's native sensitivity runs from ISO 100-32,000, and is expandable to 50-102,400. The camera uses both a Digic 6 and a Digic 6+ processor, with the former used solely for metering, freeing up the Digic 6+ to handle everything



1 **Autofocus**
This skateboarder doesn't hang around, really putting Canon's 61-point autofocus and Dual Pixel AF tech through its paces.

2 **Noise**
ISO 4,000 was required to maintain a fast enough shutter speed to freeze this subject, but image noise at this setting is impressively low.

3 **Dynamic range**
You can ramp up the sensor sensitivity and there's still enough dynamic range to capture extreme highlight and shadow detail.

else, including the 61-point AF system with 41 cross-type sensors (five of which are dual cross-type for even greater accuracy).

The AF system is sensitive down to -3EV (-4EV in Live View) – that's darker than moonlight, so focusing shouldn't be an issue in poor light, while the fact that you can use lens/teleconverter combinations with a maximum aperture of f/8 and still have the luxury of all 61 AF points (21 cross-type) will be a real draw for sports and wildlife photographers.

The Mark IV also inherits Canon's Dual Pixel AF technology, so there are phase-detection points on the imaging sensor itself, promising quicker AF acquisition than we saw in the Mark III, and performance as speedy as many mirrorless cameras.

The large 3.2-inch display boasts an impressive 1,620,000 dots and touchscreen functionality, as on the 1D X Mark II. The touchscreen interface is active all the time, enabling menu navigation and image review as well. Canon has also kept the same battery as in the 5D Mark III, so existing owners looking to use both cameras in tandem don't need two sets of batteries and chargers.

The 5D Mark IV features DCI 4K video capture at 4,096 x 2,160 pixels, at 30/25/24fps (approx 500Mbps). This also means you can extract 8.8MP JPEG images from 4K video if needed, thanks to the Motion JPEG file format available for 4K capture. This is the only file format available when shooting 4K, however, and there's no option to shoot in a flat gamma profile. Things get better at 1080p, with a host of Full HD options, as well as the ability to shoot 120fps HD video for some impressive slow-mo movies.

The 5D Mark IV has external microphone and headphone ports,

Meet the rivals...

The cameras taking on the Canon EOS 5D Mk IV...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon EOS 5DS
£2,800/$3,500
The 5DS is now the benchmark for full-frame image quality, but it is not quite as well-rounded an SLR as the 5D Mark IV.
Reviewed Page 46
★★★★★

Nikon D810
£2,400/$2,800
The Nikon D810 is a great SLR. The 36.3MP sensor delivers stunning images, and sets a high standard for image quality.
Reviewed Page 78
★★★★★

Sony Alpha 7R II
£3,000/$3,200
The A7R II has proved popular thanks to its 42.2MP resolution, generating huge images with bags of detail, with noise well controlled.
Reviewed Page 118
★★★★★

Above Canon's 252-zone RGB+IR metering system with face recognition has nailed the optimal exposure here.

as well as HDMI Mini out and USB 3.0 terminals. In addition, it sports dual CompactFlash (accepting fast UDMA 7 cards) and SD card slots, and features both Wi-Fi and NFC connectivity for transferring images to a compatible device – and that's not forgetting the built-in GPS unit for location-tagging.

At first glance the 5D Mark IV bears a striking resemblance to the outgoing Mark III (and for that matter the 5DS and 5DS R). Canon doesn't want existing 5D users to have to 're-learn' the new camera, so aims to keep the transition as hassle-free as possible.

Build and handling

Still, there have been numerous tweaks and refinements to the body. The hand grip has been enlarged, providing an even more satisfying hold when you pick the camera up, while the pentaprism viewfinder stands slightly taller to accommodate the GPS unit. Despite cramming more tech into the body, the engineers at Canon have managed to cut the weight of the 5D Mark IV by 60g compared with the Mark III, while at the same time improving the weatherproofing with extra grommets and seals.

The camera features a customisable button just below the joypad on the rear of the body. This can be assigned to perform a multitude of functions in conjunction with the front command dial. A useful option would be to set it to control ISO, allowing you to toggle the sensitivity without having to take your eye away from the viewfinder.

As you'd expect for a camera that sports a virtually identical AF configuration to the flagship 1D X Mark II (Canon states that the systems aren't completely identical, with some different internal components being used), AF performance doesn't disappoint.

The AF is linked to the 5D Mark IV's metering system, with the latter helping to detect and track coloured objects and perform face recognition.

Coverage is good, and better than in the 5D Mark III, but there's still a noticeable bias towards the centre of the frame. That minor quibble aside, the AF system performs brilliantly. Shooting in Live View, the Dual Pixel AF is a huge improvement over the relatively sluggish system on the 5D Mark III, with focusing pretty much instantaneous, making the Live View AF a much more valuable feature to have than it has been in the past.

Above Fast subjects like this cycle race peloton are a great way to test the 5D Mark IV's 7fps burst rate.

Performance

The 5D Mark IV gets Canon's 252-zone RGB+IR metering system with Intelligent Scene Analysis, and it's all the better for it compared to the older iFCL system found in the 5D Mark III. The system weights the exposure to the active AF point, and does a good job of assessing the scene as a whole to deliver an exposure that's well-balanced.

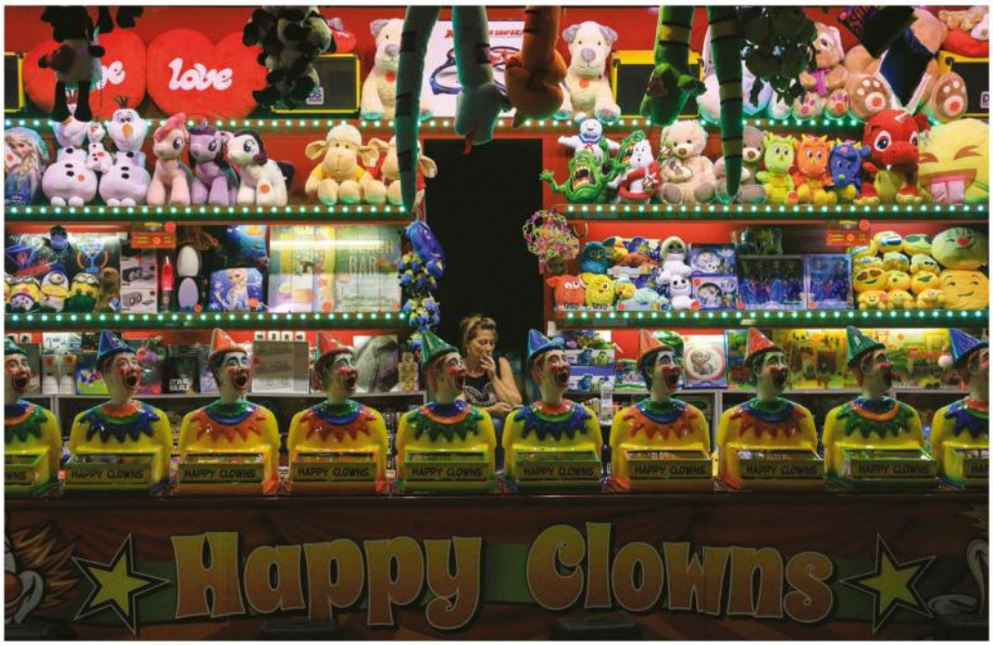
There are no nasty surprises with the white balance system either. There's a choice of either Ambience or White Priority settings, with the latter delivering neutral images even under tungsten lighting, while Ambience Priority has a bias to retain some warmth in the image.

As you'd expect from a full-frame SLR, the camera features a large and bright viewfinder with 100% coverage. As well as displaying key shooting info along the bottom, it also benefits from what Canon terms Intelligent Viewfinder II technology. This enables you to display an electronic level, along with grid lines and a host of other key shooting info that you might wish to have fed back to you when you have the camera raised to your eye.

The rear display has an impressive resolution that must make it one of the sharpest screens out there. It also makes composing shots in Live View a piece of cake – even when we used a dense 10-stop Lee Big Stopper filter, the display was incredibly clear, with no noticeable signal noise.

There were times while I was testing the 5D Mark IV when a vari-angle screen would have been welcome, especially when composing low-angle shots, but the clarity and excellent viewing angle of the display makes this omission less of an issue than with some other cameras.

That's not forgetting the touchscreen interface, which I have to say is a very welcome addition. With touch control over both the main and Quick Menus, it makes the 5D Mark IV's comprehensive menus much quicker to navigate; while the ability to pinch to zoom as well as swipe through images, makes things that much quicker.



Above Low-light performance is excellent. Given that this fairground booth was shot at ISO 8,000, there's inevitably some noise here, but it doesn't detract from the overall image quality.

The burst rate is a respectable 7 frames per second and the Mark IV can now sustain this to shoot 21 raw files before the buffer needs to take a breather. If you're shooting JPEGs, the capacity is unlimited.

Canon claims the LP-E6N battery is good for around 900 shots on a single charge. We used the camera heavily, and while we'd say 900 shots would be optimistic, we'd still be happy heading out for the day with a single battery.

Image quality

It's really no surprise to find that the results from the new 30.4MP sensor display excellent levels of detail . You should have no problems producing richly detailed prints at Super A3, while A2 prints and beyond are a realistic proposition – that's not forgetting the ability to tightly crop images if needed. ISO performance is also very good.

Results at ISO 800 still appear noise-free in our sample images, while even at ISO 2,000 results are very impressive – there are some signs of luminance noise, but it looks very organic, while there's no evidence of chroma (colour) noise.

Raw files can be pushed further in post-processing, allowing you to intentionally under-expose shots and preserve highlight detail secure in the knowledge that you can recover lost shadow detail later without your shot being ruined by the introduction of image noise.

There are no qualms about colour reproduction either. The JPEG Picture Styles produce pleasing results, while skin tones can be faithfully reproduced.

A wide range of connection ports includes mini-HDMI and USB 3.0.

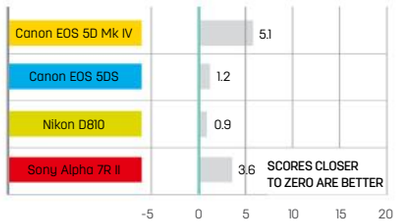
Verdict

Pretty much every element has been improved from the 5D Mark III. The 30.4MP sensor is a welcome boost in resolution compared to the 22.3MP of the 5D Mark III, along with improved noise and dynamic range performance. It's no surprise to see DCI 4K video capture, although the 1.64x crop of the sensor makes it hard to get those wide-angle shots.

The only other issue is the fairly hefty price, especially in the UK. However, the Canon EOS 5D Mark IV has to be one of the most well-rounded and complete SLRs I've seen. Suited to a range of subjects, from landscapes to sports and wildlife, it'll perform superbly in any situation.

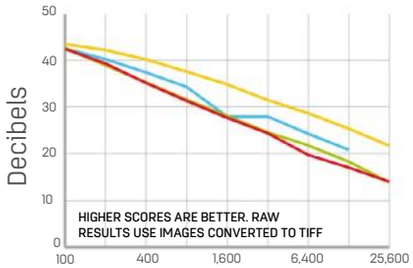
Phil Hall

COLOUR ERROR



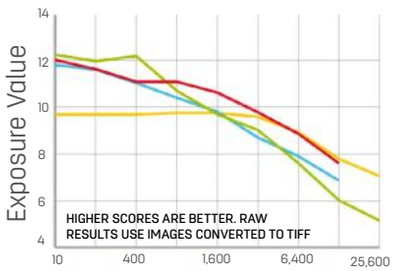
While the 5D Mark IV technically trails the pack in this test, it's not an issue you'll notice in the real-world shots it produces.

RAW SIGNAL-TO-NOISE RATIO



The 5D Mark IV's new 30.4MP image sensor really shines here, producing cleaner results than the Nikon D810 and Sony Alpha 7R II at all sensitivities in our testing.

RAW DYNAMIC RANGE



Oddly, the raw results show mediocre performance at lower ISOs, but we were using Canon's new DPP software. Adobe Camera Raw may yield better results.

WE SAY...

The Canon EOS 5D Mark IV is a marked improvement over its predecessor and performs admirably in a wide variety of shooting scenarios, although some videographers are unhappy with the 4K crop factor. That aside, and if you can justify the outlay, the 5D Mark IV is an extremely powerful and up-and-date all-rounder.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

SLR www.canon.com

Canon EOS 5DS/5DS R £2,800/$3,500

Angela Nicholson tests the Canon 5DS and 5DS R to see if they live up to their promise of setting new standards...

SPECIFICATIONS

Sensor _ 50.6 million effective pixel full-frame (36 x 24mm) CMOS
Focal length _ 1.0x conversion
Memory _ CompactFlash and SD/SDHC/SDXC
Viewfinder _ Optical with pentaprism covering 100%
Video _ Full-HD (1,920 x 1,080) at 30 / 25 / 24fps
ISO range _ 100-6,400 expandable to 10-12,800
Autofocus points _ 61, all cross-type; phase detection in reflex mode
Max burst rate _ 5fps
Screen _ 3-inch 1,040k-dot LCD
Shutter speeds _ 1/8,000-30 sec + Bulb
Weight _ 845g without lens
Dimensions _ 152 x 116 x 76mm
Power supply _ Rechargeable LP-E6N lithium-ion battery

CANON'S 5D line of SLRs was the first to bridge the gap between professional and amateur photography, giving enthusiasts an affordable route to full-frame shooting and pros a smaller, lighter back-up camera.

Now we have the 5DS and the 5DS R, both of which have 50.6 million effective pixels on their full-frame sensor – that's a count that matches that of medium-format models like the Pentax 645Z.

Neither model is set to replace the 5D Mark III: they give a higher-resolution alternative.

The 5DS and 5DS R are identical apart from a small but significant difference with the sensor (see 'What's the difference?' below), so unless otherwise stated, we'll use 5DS in this review to mean both it and the 5DS R.

Features

The 5DS has two Digic 6 processing engines instead of the single Digic 5+ processor of the 5D Mark III. This enables a native sensitivity range of ISO 100-6,400, with expansion settings taking this to ISO 50-12,800. For comparison, the native range of the 5D Mark III is ISO 100-12,800, and the expansion settings take the range to ISO 50-102,400.

1 When the Scene Intelligent Auto mode is selected, the camera analyses the scene and selects appropriate settings automatically.

2 You can create up to five My Menu tabs with customisable names in the menu – and each one can have up to six features assigned to it.

3 Although it can record video, the 5DS has no headphone socket for audio monitoring.

4 This is useful to give images a star rating and find them quickly after downloading. It can also be customised.

What's the difference?

A technical tweak enables the 5DS R to resolve more detail than the 5DS

Both the cameras have a low-pass filter over the sensor. However, the 5DS R has a secondary 'cancellation' filter that enables it to resolve a little more detail, but runs the risk of images suffering from moiré interference. Some other manufacturers have removed the low-pass filter to achieve the same thing. Canon claims that removing the filter would alter the camera's focal plane and require an internal redesign. As yet Canon hasn't been able (or willing) to explain why removing the filter would cause this, but adding a second filter does not.

Despite all the processing power, the 5DS can 'only' manage a maximum continuous shooting speed of 5fps (for 510 Large Fine JPEGs or 14 raw files with a UDMA CompactFlash card installed), rather than 6fps for 16,270 Large Fine JPEGs or 18 raw files of the 5D Mark III with the same card.

Other significant changes from the 5D Mark III include a 150,000-pixel RGB+IR metering sensor with 252 zones, and Intelligent Scene Analysis in place of the iFCL device with 63 zones; a new M-Raw images size that records 28MP images; and a USB 3.0 port. There's also an Intelligent Viewfinder II with AF point illumination in AI Servo mode.

Other introductions include a new Fine Detail Picture Style to tailor the look of JPEGs, and a collection of mirror lock-up options, a built-in intervalometer and the ability to shoot timelapse movies.

Build and handling

Outwardly the 5DS looks the same as the 5D Mark III. However, there have been some changes to the build of the camera to reduce vibrations, which could have significant implications for such a high-resolution model. The mirror movement, for example, is controlled by a mechanism to avoid the slap that is typical of SLRs and can lead to blur-inducing mirror-shake. It makes a noticeable difference to the sound and feel of the camera in use.

Externally, the 5DS has exactly the same shape and control layout as the 5D Mark III. This means you can slip seamlessly between the two, perhaps using the 5D Mark III to shoot sport or video, and the 5DS for detail-rich subjects like landscape and macro.

The 5DS has the same AF system as the 5D Mark III, which means there are quite complex options to control how the camera responds to moving subjects in continuous AF mode, plus six AF point selection modes. By default, an autofocus point (or zone) is set with the AF Point Selection button near the thumb rest on the back of the camera, then using the mini-joystick-like Multi-controller.

Being a full-frame SLR, the 5DS has a large optical viewfinder. This is bright and shows 100% of the scene, so there are no nasty surprises around the edges of images. Like the 5D Mark III, it's possible to display an electronic level in the viewfinder as well as on the main screen; but unlike

Exposure has been handled well here.

Meet the rivals...

Here are the models the Canon 5DS is up against..

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon 5D Mark III
£2,250/$2,499, body only
The same weatherproof build and control layout as the 5DS, but with just 22.3MP on the sensor.
Reviewed Issue 126

Nikon D810
£2,349/$2,997, body only
A superb 36MP full-frame SLR that ruled the roost for resolution until the 5DS came along.
Reviewed Page 78

Pentax 645Z
£6,799/$8,095, body only
Affordable in medium-format terms, this 50MP model is at home on location or in the studio.
Reviewed Issue 164

the 5D Mark III, the 5DS uses a dedicated icon instead of the AF points. This means the level stays visible even when the shutter release is depressed to focus the lens.

When using manual focus in Live View mode, the on-screen image can be magnified by 6x or 16x. This makes details clear, but you become acutely aware of how much wobble is introduced by touching the camera. It's a good reminder to engage Mirror Lock-up mode. The ability to set the shutter to fire following a set delay after the shutter release is pressed means that a remote release is unnecessary in many situations.

You can customise the screen to remove options you don't use and change the size of icons you do

The options in the 5DS's Quick menu are logical, but it's possible to customise the screen to remove any options you don't use and change the size of icons representing those that you do. It's a nice touch.

Although the 5DS isn't a natural choice for videographers, it's worth noting that like the 5D Mark III, the large Quick Control dial on the back of the camera can be used as a touch-control, so near-silent adjustments can be made to aspects such as exposure and audio recording level.

Performance

The great news is that the 5DS can resolve a fantastic amount of detail. If you want the ultimate in detail resolution, the 5DS R resolves a tiny little bit more than the 5DS, but you have to look at 100 or 200% to spot the difference – and even then it's only in the very finest detail areas. Both cameras out-resolve our resolution chart for most of their sensitivity range, and noise levels are the same from each camera.

Both cameras manage to maintain the high level of detail throughout their sensitivity range; even the ISO 12,800 expansion setting produces images with a high level of detail. At lower sensitivity settings, very fine details and subtle tonal gradations are visible at 100% in JPEG files. Much of this is also visible in images taken at ISO 6,400, but there's a fine texture of luminance noise. Chroma noise is visible at 100% in simultaneously captured raw files when all noise reduction is turned off.

There's a suggestion of luminance noise in darker even-toned areas of JPEG and raw files captured at ISO 400, but you really have to look for it at 100% on-screen. This noise becomes a little more noticeable in ISO 800 images, with chroma noise becoming just visible in raw files when all noise reduction is turned off. Our tests indicate that Canon could have given the 5DS higher sensitivity settings and image quality would have been acceptable, but it seems the company has decided to make it deliver the best stills images possible.

Like Canon's earlier iFCL metering system, the 252-zone RGB+IR metering system with Intelligent Scene Analysis of the 5DS applies a weighting to the exposure required by the subject under the active AF point, but it does a better job of

Above Thanks to the level of detail they capture, the 5DS and 5DS R are ideal for shooting landscapes.

They're not really designed for sport photography, but the 5DS and 5DS R have an excellent AF system that can track moving subjects

Canon's EOS 5DS is the world's first 50-megapixel DSLR, making it a real medium-format slayer

assessing the rest of the scene and recommending exposure values that work for the scene as a whole.

As the 5DS has the same autofocus system as the 5D Mark III, it was no surprise to find that it's highly capable and can lock on to fast-moving subjects, even in low light. When shooting a cycling event continuously at the 5fps maximum, I noticed the camera started to warm up around the card port. This seems to affect burst depth, and the number of images you can shoot drops dramatically.

At the other end of the shooting rate scale, there's a benefit to using mirror lock-up when the camera is on a tripod, even with shutter speeds of around 1/60 sec and a focal length of 100mm. I set the camera to take the shot one second after the shutter release was pressed: this produced sharper images than those taken without mirror lock-up.

When hand-holding the camera with the Canon EF 24-70mm f2.8L II USM lens mounted, I recommend keeping shutter speed at 1/125 sec or higher to be sure of getting pin-sharp results. It is possible to get sharp results at slower shutter speeds, but 1/125 sec or faster delivers the goods more consistently.

If you're shooting a moving subject, you may find you need to use a faster shutter speed than you're used to, because although the images look sharp as thumbnails or even at normal viewing sizes, they aren't completely sharp at 100%. The small pixels mean that even tiny movements can cause some blur. You may scoff at this pixel-peeping, but why would you buy a 50MP camera if you can only use the images at a size achievable by a 20MP model?

Canon cameras generally produce images with pleasing colours and the 5DS is no exception. However, probably as a result of the extra pixels delivering the huge level of detail and smooth tonal gradations, some of the files have a bit more pep about them. Using the new Fine Detail Picture Style boosts micro contrast a little, bringing out small details and giving edges a naturally sharp look.

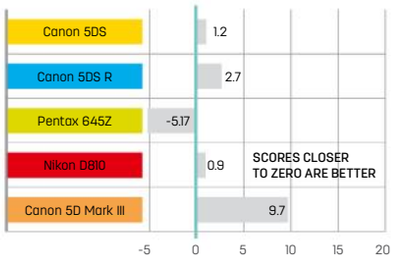
Verdict

While it has an autofocus system that can keep up with fast-moving subjects and can record high quality video, the 5DS/5DS R is designed to take high-quality stills images. The images from the 5DS/5DS R have an incredible amount of detail, with great colour and exposure in most situations. Its handling is also excellent, using the control layout of teh 5D Mark III.

Whichever model you opt for, you need to focus carefully, follow the guidelines to avoid camera shake and ensure your lenses can match the resolving power. There's a list of recommended lenses on Canon's website at www.bit.ly/dc167canon.

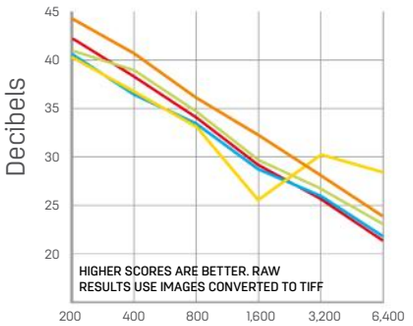
Angela Nicholson

COLOUR ERROR



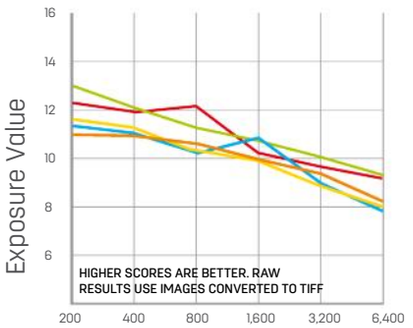
With good colour accuracy, the 5DS produces natural-looking JPEG files with appealing saturation.

RAW SIGNAL-TO-NOISE RATIO



These results indicate that the 5DS produces noisier images. This isn't surprising given the likely pixel density of its sensor.

RAW DYNAMIC RANGE



While the 5DS's dynamic range is good at the lower sensitivity values, it doesn't quite match the competition.

WE SAY...

The Canon 5DS and 5DS R are superb cameras that capture a huge amount of detail. Before you commit to the investment, however, make sure your lenses can match the resolving power.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

PORTABLE DRIVES

Keep your photos and videos mobile without sacrificing storage or speed

www.delkindevices.com

Delkin Devices 1TB RhinoDrive

£399/$380

With its rubberised casing and silicone bumper, the RhinoDrive offers ultimate shock protection. It's far from sleek, though, and the SSD within can't match the cheaper Samsung drive for speed.

OVERALL ★★★½☆

www.g-technology.com

G-Technology 1TB G-Drive ev ATC

£118/$130

This toughened drive is protected by a crush-, dust- and shock-resistant compartment that also has a built-in USB cable. Using a conventional hard drive keeps the cost down, but it's no slouch.

OVERALL ★★★★½

www.samsung.com

Samsung Portable SSD T3 500GB

£160/$177

At 74 x 58 x 10.5mm, this svelte metal-shelled SSD is the smallest and lightest drive here. It also boasts winning performance, outpacing the Delkin SSD while still being shock-resistant.

OVERALL ★★★★★

www.seagate.com

Seagate Backup Plus Ultra Slim 2TB

£90/$90

Seagate claims that this 9.6mm design is the world's thinnest 2TB mobile hard drive. It looks the part too, and transfers images and video at a respectable rate, despite using a traditional hard drive.

OVERALL ★★★★☆

www.transcend-info.com

Transcend StoreJet 25M3 2TB

£90/$103

The plasticky StoreJet doesn't ooze quality, but it's shock-resistant to military standards. Transfer speeds are the fastest on test for a hard drive, and with 2TB of storage you get incredible value.

OVERALL ★★★★★

www.wd.com

WD My Passport Ultra 1TB

£60/$60

WD's compact contender is narrowly beaten into last place here for speed, but it's well-priced and includes extensive back-up and drive encryption software. Even so, it's an average overall package.

OVERALL ★★★½☆

SLR www.canon.com

Canon EOS-1D X Mark II

£4,799/$5,999

Canon's new top-end SLR has the specs to impress. If it delivers on the promise, it could be phenomenal...

SPECIFICATIONS

Full-frame – (35.9 x 23.9mm) CMOS with 20.2 million effective pixels
Focal length conversion – 1x
Memory – One CF, one CFast
Viewfinder – Optical with pentaprism and 100% coverage
Max video resolution – 4K (4,096 x 2,160 pixels)
ISO range – 100-51,200; expandable to 50-409,600
Autofocus points – 61; 41 cross-type including five dual cross-type
Max burst rate – 14fps (16fps in Live View mode with focus and metering set at start)
Screen – 3.2-inch 1,620,000-dot Clear View II TFT
Shutter speeds – 30-1/8,000 sec plus Bulb
Weight – 1,340g (body only)
Dimensions – 158 x 168 x 83mm
Power supply – LP-E19 rechargeable battery (supplied); LP-E4N, LP-E4

Provided sensitivity is kept to ISO 25,600 or lower, the 1D X Mark II produces superb images

THE 1D X Mark II is Canon's replacement for the 1D X, so it sits at the top of the manufacturer's stills-orientated SLR line-up. It's aimed at professional news and sports photographers. The 1D X Mark II has a full-frame sensor, but its resolution has been raised to 20.2 million effective pixels.

Highlights include a standard sensitivity range of ISO 100-51,200, with expansion settings taking it to ISO 50-204,800; a maximum continuous shooting rate of 14 frames per second, with full exposure metering and autofocus operation; and a 61-point autofocus system boasting 41 cross-type sensors and five dual cross-type sensors.

Build and handling

The Mark II's 3.2-inch 1,620k-dot screen is touch-sensitive. However, the touch control is only used in Live View or Video modes for setting the AF point, or in Video mode for turning the continuous autofocusing on or off. That's a shame, as the Quick Menu is large enough to be navigated by touch.

Both the 1D X and the 1D X Mark II have 3.2-inch Clear View II TFT screens, but the original camera's has 1,040,000 dots while the Mark II's has 1,620,000 dots. Those extra 580,000 dots make this screen the clearest and sharpest I've ever seen, and it stands up to reflections well.

Performance

Provided the sensitivity is kept to ISO 25,600 or lower, the 1D X Mark II produces superb images. While the camera does a reasonable job of detecting and tracking a subject in Automatic Selection AF mode, using one of the Point or Zone AF modes is a safer bet if you can keep the active area over the subject.

Metering is taken care of by the EOS iSA (Intelligent Subject Analysis) system, with a dedicated 360,000-pixel RGB+IR sensor. It was reliable in a range of conditions; I didn't once have to use exposure compensation unexpectedly.

Angela Nicholson

1 It's the first time that Dual Pixel CMOS AF technology has appeared on a full-frame sensor.

2 Live View focusing can be slowed to make it smoother and more professional-looking when shooting video.

3 The Quick Menu is customisable; it would be nice to have one each for the Stills and Video modes, though.

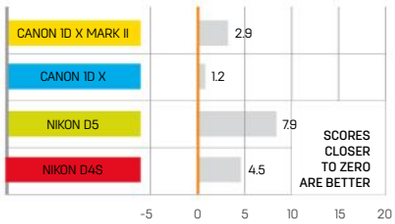
4 A duplicate set of key controls means they're at your fingertips whether you're shooting in portrait or landscape orientation.

1
Fast AF
Zone AF focusing mode was ideal for this scene: it made it easier to keep the focus area over the stunt man as he ran and jumped.

2
14fps shooting
Shooting at 14fps meant I was able to select the perfect shot from a sequence of images taken during the explosion.

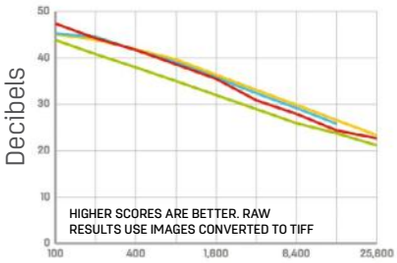
3
Continuous metering
The metering system continues to operate while shooting at 14fps, so the exposure varied a little as the bright flames appeared.

COLOUR ERROR



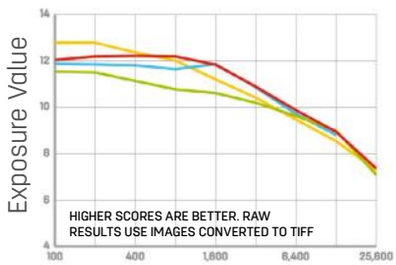
These scores indicate that the 1D X Mark II is one of the more accurate of the cameras on test. The real-world shots also look very good, with pleasant saturation.

RAW SIGNAL-TO-NOISE RATIO



The Canon 1D X Mark II performs well here, beating the Nikon D5 throughout the Canon's sensitivity range. However, real-world shooting shows a more closely run race.

RAW DYNAMIC RANGE



The 1D X Mark II raw files achieve a better score than the JPEGs for much of the sensitivity range. For lower sensitivity values, the Canon captures a broader range of tones.

WE SAY...

Canon may not have gone for the headline-grabbing numbers of the Nikon D5, but the 1D X Mark II makes lots of incremental improvements upon the 1D X that add up to make it one heck of a camera. It's capable of getting moving subjects sharp in very low light and delivers usable images. In more average conditions, it captures a lot of detail.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★★☆
OVERALL	★★★★★

Meet the rivals...

The cameras taking on the Canon EOS-1D X Mark II

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon 1D X
£3,399/$4,599 (body only)
The Mark II's predecessor has an 18.1MP full-frame sensor, 61-point AF system and a maximum continuous shooting rate of 12fps.
Not reviewed

Nikon D5
£5,399/$6,497 (body only)
The 1D X Mark II's main rival has a 20.8MP full-frame sensor and maximum sensitivity setting of ISO 3,280,000 – but don't use that value!
Reviewed Page 74
★★★★★

Nikon D4S
£4,189/$5,997 (body only)
A popular choice with Nikon pros until the D5 came along, this full-frame model has a 16.2MP sensor and 11fps shooting.
Reviewed Issue 153
★★★★★

CSC www.fujifilm.co.uk

Fujifilm X-T2

£1,399/$1,599 (body only)

The X-T1 brought real class and style to the mirrorless camera market; the X-T2 adds speed and resolution

SPECIFICATIONS

Sensor _ 24.3MP APS-C CMOS sensor (23.6x15.6mm)
Focal length conversion on lens _ 1.5x
Memory _ 2 x SD/SDHC/SDXC
Viewfinder _ Electronic viewfinder, 2,360,000-dot OLED
Max video resolution _ 4K (3,840 x 2,160)
ISO range _ 200-12,800, expandable to 100-51,200
Autofocus _ Intelligent Hybrid AF, 325 points
Max burst rate _ 14fps (electronic shutter mode)
Screen _ 3-inch, 1,040,000 dots, vertical/horizontal tilt
Shutter speeds _30-1/8,000 sec, Bulb
Weight _ 507g (body only, with battery)
Dimensions _ 132.5 x 49.2 x 91.8mm
Power supply _ NP-W126S lithium-ion battery (supplied)

The SLR-like X-T2 is designed for the brand's growing range of fast zooms

THE X-T2 sits alongside the X-Pro2 as the joint flagship camera of the brand, and Fujifilm believes it now offers two distinct options for photographers. The X-Pro2, with its rangefinder design, is less obtrusive and better suited to Fujifilm's range of prime lenses, while the more SLR-like X-T2 is designed for the brand's growing range of fast zooms.

It's no surprise the X-T2 gets the impressive 24.3MP APS-C X-Trans III CMOS sensor first seen in the X-Pro2, and the 50% larger pixel count is a welcome upgrade from the 16.3MP sensor in the X-T1.

The X-T2's electronic viewfinder has the same 2.36 million-dot OLED display with 0.77x magnification, but it's now twice as bright, there's an automatic brightness adjustment function and it features a higher baseline frame rate of 60fps – and there's now a Boost mode that increases this to 100fps to ensure that fast-moving subjects are displayed smoothly, although this also drains the battery faster.

1 The X-T2 uses Fujifilm's expanding range of premium X-mount zoom and prime lenses.

2 The electronic viewfinder has a high resolution (2.36MP) and a higher frame rate for less lag.

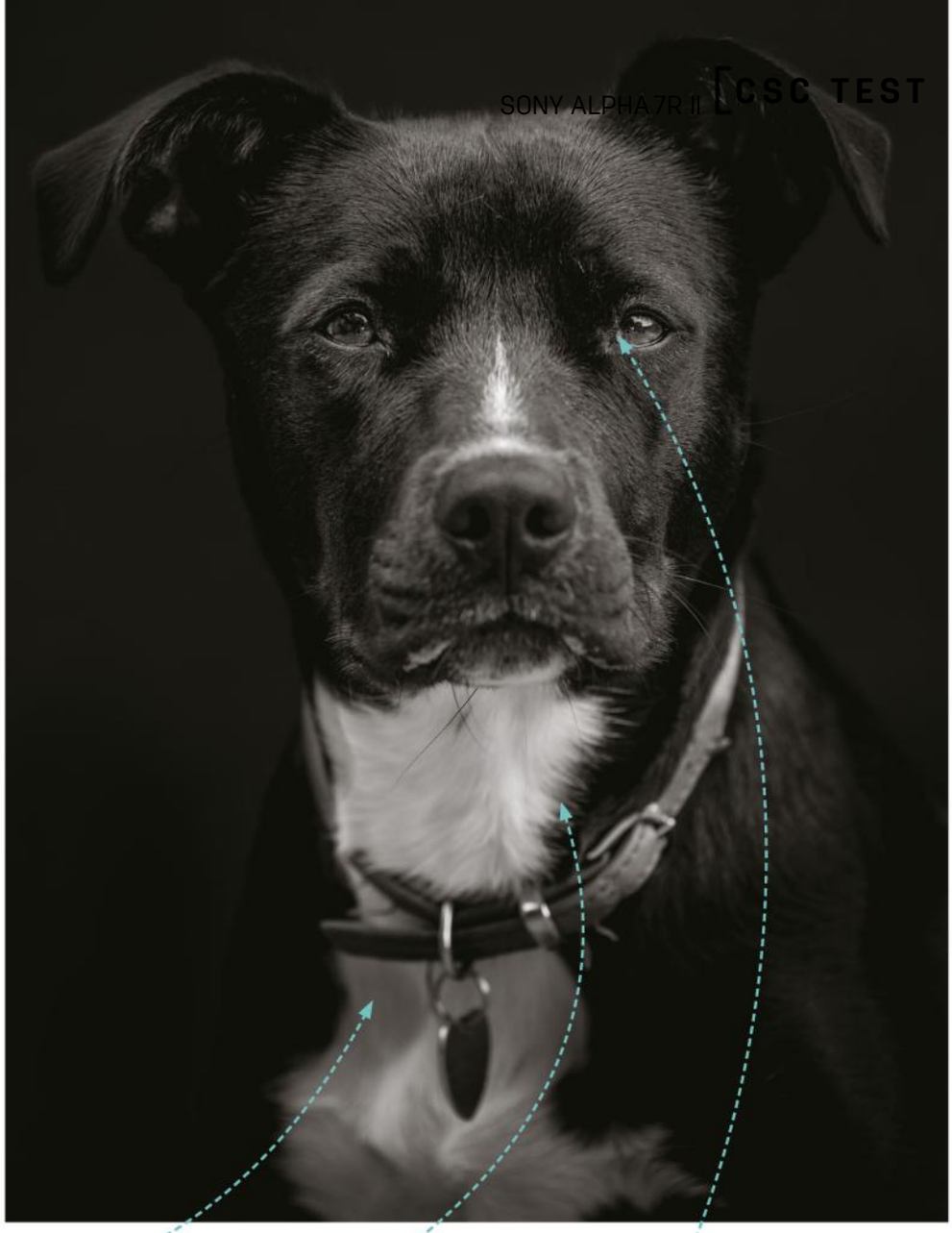
3 Unusually, the rear screen tilts sideways as well as vertically – handy for portrait-format shots.

4 This is a modern camera with classic controls, including physical ISO, shutter speed and exposure compensation dials.

The rear display has been updated too. The 3.0-inch display keeps the same 1.04 million-dot resolution, but it has a new double-jointed design, making it possible to pull the screen outwards and away from the body when the camera is tilted on its side for portrait-format shots.

Interestingly, Fujifilm has not included a touchscreen – it's spoken with customers and says there isn't the hunger for it on X-series cameras.

The X-T2 is the first Fujifilm X-series camera to shoot 4K UHD (3,840 x 2,160) video, offering a bit rate of 100Mbps (compared to 34Mbps on the X-T1) at 30, 25 or 24fps. It offers recording times of up to 10 minutes – although if you attach the optional VPBC-XT2 battery grip, this is extended to 29 minutes and 59 seconds. There's HDMI output, audio volume live monitoring and adjustment, and a microphone socket in the body (and a 3.5mm headphone terminal in the optional grip). This



all-new VPB-XT2 battery grip improves the burst performance of the X-T2 from 8fps to 11fps. Fujifilm claims the grip is good for 1,000 shots with its two batteries fully charged – and that's not forgetting the other battery in the camera.

Finally, the X-T2 now features dual SD card slots, both of which are UHS-II compatible.

Build and handling

There's no radical redesign here. Fujifilm has elected to take the X-T1 as its starting point, refining and tweaking elements of that design. As before, the body is crafted from magnesium alloy, providing a solid and durable feel. It's also weather-sealed at 63 points to protect the camera from dust and moisture.

The ISO and shutter speed dials have been raised slightly compared with the X-T1, while the dial locks that divided opinion on the X-T1 have been adapted, making it now possible to toggle each dial's setting without the need to release the lock. This is certainly a welcome improvement, and makes it easier to change settings as the camera is raised to your eye, though it still feels slightly awkward when setting the ISO like this.

The exposure compensation dial now has also been tweaked, so as well as offering physical adjustments of up to ±3EV in 1/3 increments, there's now a C position to set compensation up to ±5EV with the front dial.

The X-T2 does away with a dedicated video button, instead having the setting amongst the drive modes. It also gets a multi-directional focus lever that the thumb can rest on, making it a much quicker process to select the focus area.

Other little tweaks include a larger eye cup for more comfortable viewfinder shooting, locks on both the card cover and the battery compartment, and a slightly enlarged handgrip and rear thumb rest. The overall feel of the X-T2 is just that bit nicer than the X-T1. It's a pleasant camera to pick up and shoot with.

Performance

Mirrorless cameras have to get over some skepticism towards AF performance and moving subjects. The X-T1 had a solid if rather unremarkable AF system which saw a fairly major firmware upgrade to >

1 **Tonal rendition**
Fujifilm's film simulation modes produce high-quality JPEG images, although it's best to shoot raw for extra tonal headroom.

2 **Lens choice**
This was shot with the Fujifilm 40-150mm f/2.8 constant-aperture zoom, one of many premium-quality X-mount lenses.

3 **Autofocus**
Fujifilm's new high-tech hybrid AF system is as effective for static subjects like this canine portrait as it is for moving ones.

Meet the rivals...

The cameras taking on the Fujifilm X-T2...

FOR MORE CAMERA REVIEWS, VISIT www.techradar.com/cameras

Olympus Pen-F
£899/$999
The Pen-F combines retro chic with cutting-edge tech. Outside it has old-school controls; inside it has a new 20MP Micro Four Thirds sensor.
Reviewed Page 86
★★★★½

Panasonic GX8
£770/$998
The MFT sensor is smaller than the X-T2's but Panasonic squeezes out terrific image quality in its flagship rangefinder-style camera. It's good value, too.
Reviewed Issue 170
★★★★½

Sony Alpha 7 II
£1,349/$1,698
With full-frame image quality, five-axis in-body image stabilisation and a sound hybrid AF system, Sony's mirrorless camera is terrific value.
Reviewed Issue 162
★★★★★

The X-T2's continuous autofocus performance represents a big step forward, both in comparison to the X-T1 and for mirrorless cameras in general.

boost AF performance, but it still didn't really satisfy the needs of those shooting fast-moving subjects.

The new hybrid AF system in the X-T2 employs both phase-detection and contrast-detection points, with up to 169 phase detect points arranged in a large square formation (13 x 13) in the centre, supplemented by two grids of 6 x 13 contrast-detect points either side, to deliver a total of 325 focusing points across a large area of the frame.

Fujifilm has overhauled the AF algorithm to boost accuracy, as well as allowing you to fine-tune how the camera reacts to moving subjects.

These three parameters are Tracking Sensitivity, Speed Tracking Sensitivity and Zone Area Switching. The X-T2 features five presets, as well as a custom setting allowing you to tinker with these variables yourself.

We trialled it on fast-moving cars using Preset 3 (accelerating/decelerating subjects); and, coupled with the improved frequency of the AF search timing, reduced from 280m/sec on the X-T1 to just 114m/sec, it rarely missed a beat.

The burst rate is a decent 8fps, and with an SDHC UHS-II card you can expect to shoot 27 uncompressed raw files at this rate before the buffer fills up. If you're shooting JPEGs, 81 files are possible before it slows down.

With the optional battery grip, the burst rate increases to 11fps, or if you switch to the electronic shutter, it's possible to shoot at 14fps without the need for the optional grip.

The X-T2's new 24.3MP CMOS sensor produces a noticeable jump in detail recorded compared to results from the X-T1. It does an excellent job at resolving detail across the sensitivity range, especially when compared to APS-C rivals with a similar resolution.

The X-T2's X-Trans III CMOS sensor delivers very good levels of detail for an APS-C sized sensor.

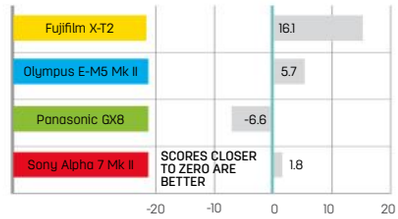
Dynamic range is good at lower sensitivities, and in addition there's Fujifilm's own expanded Dynamic Range option (both for JPEG and raw), though this does require a higher base sensitivity. At higher ISO settings above ISO 1,600, things tail off slightly, but are still more than acceptable up to ISO 25,600.

The original X-T1 has been a firm favourite amongst photographers, but the AF performance, particularly in continuous mode, was a stumbling block. The X-T2 changes that, with a big leap in AF performance. It delivers fast and reliable autofocus that when matched with the fast burst shooting mode, make the X-T2 a very capable camera for action.

When you factor in the new sensor and its really nice results, the X-T2 is the most desirable mid-range cameras available right now.

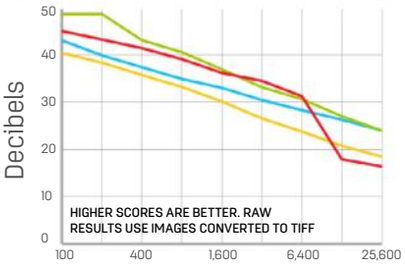
Phil Hall

COLOUR ERROR



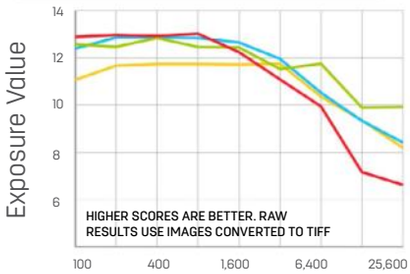
The X-T2's colour error value is on the high side, but that's more a reflection of its rich and intense colour reproduction than any issue with specific colours.

RAW SIGNAL-TO-NOISE RATIO



The X-T2 delivers good noise control, despite its relatively high resolution. We used the bundled SilkyPix raw converter for this test, though not for dynamic range (see below).

RAW DYNAMIC RANGE



Initially, the X-T2's raw dynamic range looked poor, but this was traced back to the SilkyPix raw converter. Adobe Camera Raw's dynamic range results are more in line with its rivals.

WE SAY...

With a brilliant new AF system, lovely handling and an updated sensor that delivers pin-sharp images, the X-T2 has to be one of the most desirable cameras available right now. It combines classic-style controls with state-of-the-art imaging technology and an expanding range of first-rate lenses.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

ACTION CAMERA www.gopro.com

GoPro Hero5 Black £349/$399

A new design and fresh features get GoPro back to the top of its game

IT'S no secret that GoPro as a company has been struggling – and no wonder with all the jumping, crashing and extreme sports it's been backing. As the company faltered, the copycats moved in, with a swathe of action cameras that have been as good, if not better than the Hero4.

GoPro needed to do something big in response – and that has arrived in the form of the GoPro Hero5 Black. It's not just a refinement of the Hero4: it's a revolution in the action camera market. Spec-wise it appears much the same as the Hero4, but what it lacks in upgraded video specifications, it more than makes up for elsewhere. Features such as voice activation, manual exposure control and a two-inch touchscreen really make this GoPro's most usable camera yet.

Build & handling

A sleeker design does away with the waterproof housing, yet the camera is still protected to a depth of 10m. All control buttons are designed flush to the body, and have been simplified to follow the one-touch approach first adopted by the Hero4 Session. The new button style works seamlessly with the touchscreen LCD, making setting adjustments through the camera as easy as using the app. Voice activation is another boost to usability: just shout "GoPro Start Recording" to start and "GoPro Stop Recording" to stop. It works perfectly, although you get odd looks.

Performance

Video quality is the most important factor in an action camera, and is where GoPro has traditionally led the field. The Hero4 Black's footage was exceptional. Despite GoPro announcing improvements in the Hero5, you'd be hard pressed to see any difference: it's still just exceptional quality in good light. The GoPro Hero5 Black is compact, rugged and ready to go. It's the best 4K action camera on the market right now.

Alastair Jennings

1 This screen gives you a convenient display of battery life, recording mode and resolution, as well as the remaining card capacity.

2 New to the Hero5 is Linear Field of View mode. This eliminates lens barrel distortion, albeit at a cost of slightly reducing the 14mm-equivalent lens' field of view.

3 You get curved and flat self-adhesive mounts in the box, as well as this bracket to attach the GoPro to a mount. It has a safety stop to prevent the bracket slipping out of a faulty mount.

SPECIFICATIONS

Video resolution _ 3,840 x 2,160
Image resolution _ 12MP
ISO range _ Video, ISO 400-6,400; stills, ISO 100-1,600
Autofocus range _ N/A
Wireless _ Yes
LCD Screen _ 2-inch touchscreen
Shutter speeds _ Dependent on resolution and mode
Weight _ 117g
Dimensions _ 60 x 30 x 45mm
Power supply _ Lithium-ion 1,220mAh, 4.40V
Waterproof _ 10m (33 ft)

WE SAY...

The Hero5 is the 4K action camera that we wanted, with more straightforward menus on a two-inch touchscreen and out-of-the-box water resistance. Great video quality further justifies the price.

VERDICT

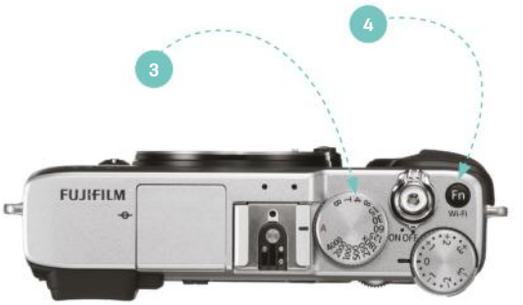
FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★★½
OVERALL	★★★★★

CSC www.fujifilm.com

Fujifilm X-E2S

£549/$699 (body only)

The X-E2S looks to refresh what the X-E2 offered. Where does this leave it in an expanding category?



SPECIFICATIONS

Sensor _ 16.3MP APS-C X-Trans CMOS II
Focal length conversion _ 1.5x
Memory _ SD/SDHC/SDXC (inc support for UHS-I)
Viewfinder _ 0.5 inch organic EL Real Time Viewfinder, 2.36 million dots
Max video resolution _ Full HD (1,920 x 1,080) up to 60p
ISO range _ 200-6,400 (expandable to 100-51,200)
Autofocus points _ 49 points (expandable to 77 points)
Max burst rate _ 7fps
Screen _ 3 inch LCD, 1.04 million dots
Shutter speeds _ 30-1/4,000 sec (1/32,000 sec using electronic shutter), Bulb
Weight _ 350g (including battery and memory card)
Dimension _ 129 x 75 x 37mm
Power supply _ Rechargeable lithium-ion battery (NP-W126)

Noise is well controlled throughout the ISO range and detail is generally good

THE Fujifilm X-E2S updates the well-regarded X-E2 with a modest collection of improvements. Many of these concern focus, with the inclusion of a 49-point AF system that can be expanded to 77 points, as well as the option to track subjects with new Zone and Wide/Tracking options and the promise of faster focusing speeds. A new electronic shutter permits near-silent shooting and a top shutter speed of 1/32,000 sec.

These are joined by the same 16.3MP X-Trans CMOS II sensor as before, as well as a 2.36 million dot electronic viewfinder and a 3-inch LCD that dominates the rear. Fujifilm's Film Simulation modes provide control over colour and tonality, while Wi-Fi connectivity means you can leave your card reader at home.

Build & handling

The camera has been fashioned with a sturdy metal top plate and milled dials, with a textured wrap and a gently redesigned grip on the front. The rear command dial has also been restyled; this feels good under the thumb, although it'd be useful to have the Q button further down the body for easier access.

The LCD and viewfinder both perform well, although increasing the LCD's brightness outdoors is a good idea, as it can sometimes be difficult to view. The focusing system performs admirably in good light and only slows a touch when faced with darker conditions, while the kit lens' image stabilisation system proves to be effective too.

Performance

With images, noise is well-controlled throughout the ISO range and detail is generally good, although there is a little softness at the telephoto end of the lens at f/4, so it's best to use a smaller aperture where possible. The standard of JPEGs straight out of the camera means these can be relied upon most of the time, although any raw files can be quickly spruced up with in-camera processing.

Matt Golowczynski

1 The revised grip doesn't make too much difference, but the camera handles well nonetheless.

2 Controls on the rear are mostly large, well spaced out and clearly identified.

3 The dials on the top plate provide immediate control over shutter speed and exposure compensation.

4 An easily reached Fn button accesses Wi-Fi as standard, but this can be customised.

1

Bokeh brilliance

Being able to focus closely to the subject together with the kit lens' maximum telephoto aperture of f/4 allows for lovely, creamy, defocused backgrounds.

2

Metering

The camera's default multi-metering pattern has done a good job at balancing the exposure here. Highlights have been kept in check and details are visible in shadows.

3

Sharp details

In a shot captured at a shutter speed of 1/70 sec, the image stabilisation system in the lens has intervened to maintain sharpness in focused areas.

Meet the rivals...

The cameras taking on the Fujifilm X-E2S

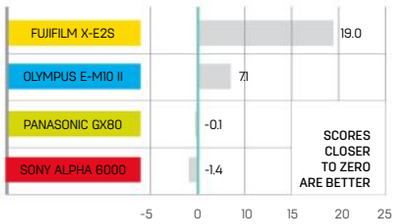
FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Olympus OM-D E-M10 II
Price: £394/$699 (inc 14-42mm lens)
The diminutive E-M10 II matches the X-E2S with a 16MP sensor, a 3-inch LCD screen and a 2.36-million-dot viewfinder.
Reviewed Page 18

Panasonic Lumix GX80
Price: £549/$698 (inc 12-32mm lens)
A slimmed-down version of the excellent GX8, with its 16MP Micro Four Thirds sensor allowing 4K video shooting.
Not reviewed

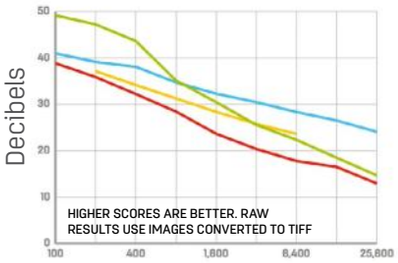
Sony Alpha 6000
Price: £549/$698 (inc 16-50mm lens)
The A6000's 24.3MP sensor and 11fps burst shooting make it a very strong competitor, as does its cracking focusing system.
Reviewed Issue 155

COLOUR ERROR



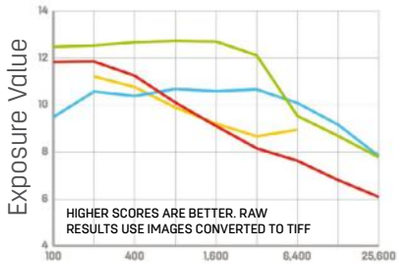
Sadly, this is one area where the X-E2S falls short, with lab testing revealing colours to be slightly out of line when the better performance of rival models is considered.

RAW SIGNAL-TO-NOISE RATIO



While the X-E2S doesn't fare too badly for noise in its raw files, performance by rival cameras – notably the Panasonic GX80 – shows it to be a touch behind.

RAW DYNAMIC RANGE



A decent start and finish from the X-E2S with regards to dynamic range in raw files, but performance in the middlemost ISO settings leaves room for improvement.

WE SAY...

While there may not be a world of difference between the X-E2S and the model it updates, it nevertheless has a lot going for it. With a lovely design, an excellent viewfinder, compatibility with a range of high-quality glass and great image quality straight out of the camera, it's a welcome and competent addition to the mid-range mirrorless sector.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★½☆
VALUE	★★★★☆
OVERALL	★★★★☆

CSC www.fujifilm.com

Fujifilm X-Pro2

£1,349/$1,699 (body only)

With a new sensor and an overhauled AF system, this is a significant update to a revered pioneer

SPECIFICATIONS

Sensor _ 24.3MP APS-C X-Trans CMOS III
Crop factor _ 1.5x
Memory _ SDHC/SDXC (UHS-II in slot 1)
Viewfinder _ 0.48in Advanced Hybrid Multi Viewfinder, 2.36million dots
Max video resolution _ Full HD (1,920 x 1,080) up to 60p
ISO range _ 200-12,800; expandable to 100-51,200
Autofocus points _ 77 points (expandable to 273 points)
Max burst rate _ 8fps
Screen _ 3in LCD, 1.62 million dots
Shutter speeds _ 30-1/8,000 sec (to 1/32,000 sec in electronic shutter mode), Bulb
Weight _ 445g (body only)
Dimensions _ 141 x 83 x 46mm
Power supply _ Rechargeable lithium-ion battery (NP-W126)

A new three-inch LCD screen offers an impressive 1,620k-dot resolution

FUJIFILM's X-Pro1 provided the firm with a solid start to its X-series range of interchangeable-lens cameras – but in the face of technological progress, its winning formula could only keep the original model afloat for so long. The X-Pro2 has now arrived to pick up the baton, debuting a 23.4MP X-Trans CMOS III sensor and an upgraded X Processor Pro, together with a raft of changes across the rest of the spec sheet.

The X-Pro1's existing autofocus system, which was notable for its shortcomings, has been replaced with a new 77-point system in the X-Pro2. This sees 40% of the frame covered by phase-detection pixels and a 273-point-expansion option, together with Zone and Wide/Tracking options for moving subjects.

The hybrid viewfinder has also had its electronic panel upgraded from 1.44 million to 2.36 million dots, while the optical finder now offers the option of a small electronic rangefinder in its corner to assist with focus, exposure and white balance. A new three-inch LCD screen offers an impressive 1,620k-dot resolution.

1 The shallow grip has a textured coating that gives good purchase.

2 This hotshoe allows compatible flashguns to be mounted.

3 The screen is fixed rather than tilting, which is a shame.

4 Small prime lenses with an aperture ring are the ideal choice for the X-Pro2.

Build & handling

The magnesium-alloy body is fitted with two SDHC/SDXC card slots on the side, which means the X-Pro2 doesn't have to be taken off a tripod for these to be accessed, unlike the X-Pro1. The body is sealed against dust and splashes. Other notable features include uncompressed raw recording, Wi-Fi connectivity and a top shutter speed of 1/8,000 sec (expandable to 1/32,000 with the camera's electronic shutter).

The main design change sees Fujifilm gracing the X-Pro2's front plate with a new command dial. This joins the previously seen rear dial, while a control for the ISO setting has been integrated into the shutter-speed dial on the top plate. This is adjusted by pulling the dial upwards; while perfectly usable, it's somewhat

The viewfinder is much improved, with a maximum display rate of 85fps, meaning that details appear smooth and natural

fiddly, and also means that the ISO setting can no longer be changed through the menu system.

The shutter speed dial itself, however, is less obstructed than the X-Pro1's, and thus easier to turn. The exposure compensation dial is also now larger than before and can apply up to -/+3EV compensation (and up to -/+5EV on its new 'C' setting), although it suffers from the common issue of being inadvertently knocked out of position all too easily.

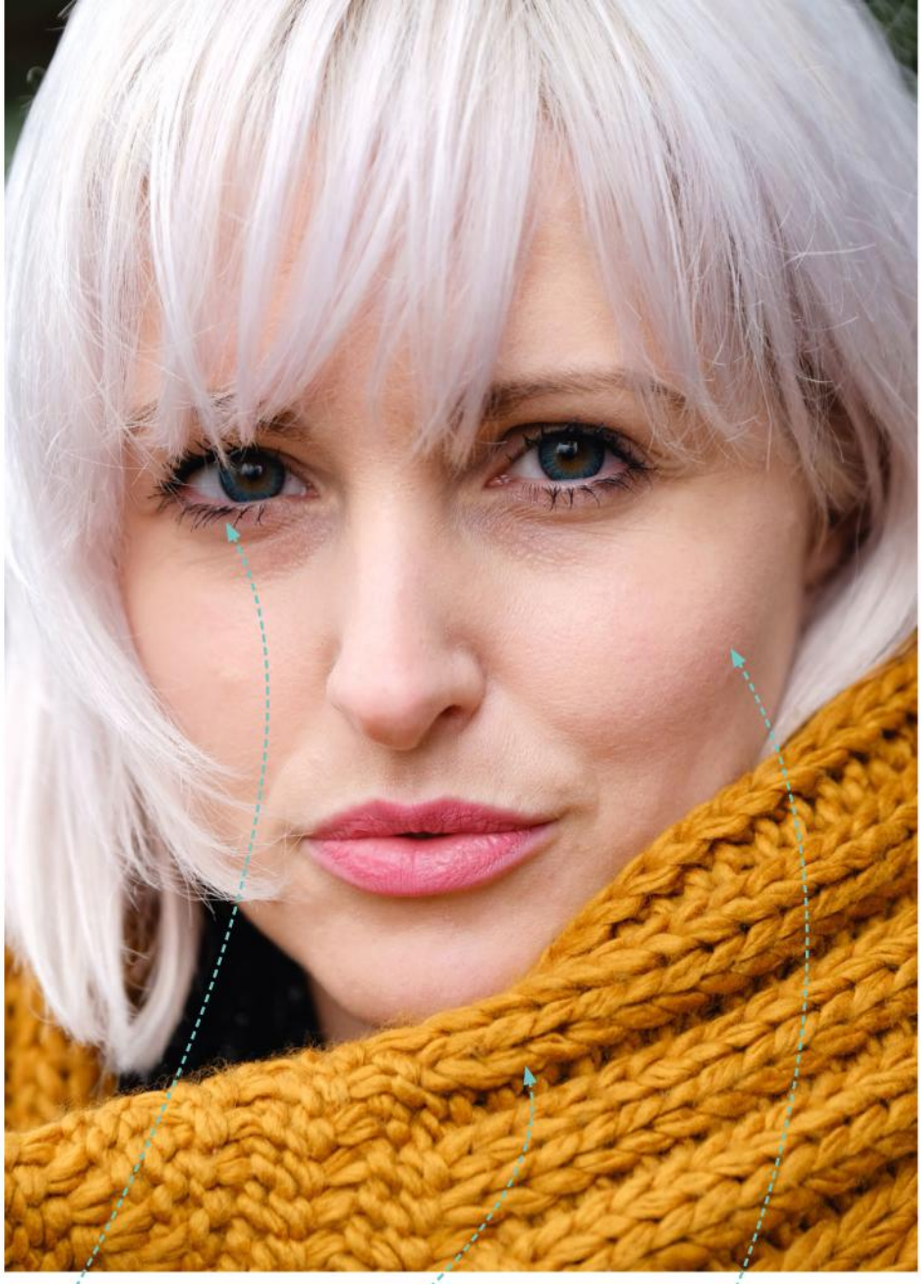
The viewfinder is much improved, with a faster display rate of 85fps (in the camera's High Performance mode) meaning that details appear smooth and natural when moving around the scene. Its high resolution means that clarity is excellent. It also does well to keep the feed relatively clean when lighting conditions fall.

While it's a shame that the LCD screen beneath the viewfinder is neither touch-sensitive nor physically adjustable in any way, it similarly displays details well and has a decent viewing angle when used away from the face (at ground level, for example).

Performance

Focusing speeds are noticeably improved over the X-Pro1, bringing this more into line with rival models. The new Zone and Wide/Tracking modes also mean that the camera can be used to follow moving subjects where its predecessor could not, doing well to stay with the subject in good light and contributing to a high hit rate when combined with the camera's 8fps burst mode. Now and again, the system is distracted by surrounding subjects, but this is true of many similar systems.

Images from the X-Pro2 are characterised by accurate white balance in most conditions, with the automatic setting only really showing any serious errors under >



1 **Face detection**
The X-Pro2's face detection system does well to identify subjects, ensuring that exposure is accurate and eyes stay focused.

2 **Detail**
Every detail of the model's skin is recorded faithfully and the natural texture in the woollen scarf is beautifully captured.

3 **Skin tones**
Skin tones are rendered nicely by default, but the Film Simulation modes give scope to apply different effects if you prefer.

Meet the rivals...

The cameras taking on the X-Pro2...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Olympus E-M5 II
£749/$1099 (body only)
With its tilting touchscreen and access to a wide range of compatible optics, the E-M5 II is ideal for creative shooting.
Reviewed Page 90
★★★★☆

Panasonic GX8
£575/$1198 (body only)
While some may prefer the X-Pro2's sensor, the 20.3MP GX8 CSC has the advantage of 4K video, and is around half the price.
Reviewed Page 94
★★★★½

Sony Alpha 7 II
£1,349/$1,698 (body only)
The same 24.3MP sensor resolution as the X-Pro2, but with a full-frame sensor, built-in image stabilisation and a lower price.
Reviewed Issue 171
★★★★★

The X-Pro2 enables you to reduce the size of the focusing point, which was helpful here, as it enabled me to focus tightly on the stamens of the flower in this shot.

The effects of the camera's Low Noise Reduction option can be seen in this ISO 12,800 image, but good detail has been retained in busier parts of the scene.

certain mixed natural/artificial sources. Colours are accurate and pleasing on the default Standard/ Provia Film Simulation option.

The metering system does well in unbalanced scenes dominated by highlights or shadows, although highlights can occasionally roll off sooner than expected.

There's typically a little noise visible in images at the camera's base sensitivity of ISO 200, although this is generally well-controlled throughout much of the sensitivity range. The camera's noise-reduction options can successfully process out the worst of this without too many artefacts remaining, although better results can be achieved through manually processing raw images.

While both the X-Pro2's sensor and many of the lenses ideally partnered with it lack image stabilisation, the OIS system found inside certain lenses does make a difference to the sharpness of images at longer focal lengths and slower shutter speeds. I found this to work to an advantage of around 3EV on average with the XF 50-140mm f/2.8 R LM OIS WR, for example, although this varies with subject distance.

It's great to see more control over video recording options than before, not to mention a port for external microphones, as the camera's built-in microphones can be troubled by wind noise when recording outside. Footage is recorded smoothly and with good detail, and artefacts aren't as visible as on the X-Pro1.

At 210 frames on the camera's High Performance setting and 250 on the Standard option, you may need a spare battery. There's an Economy setting that boosts this to 330 frames, although the drop in electronic viewfinder performance may discourage you from using this.

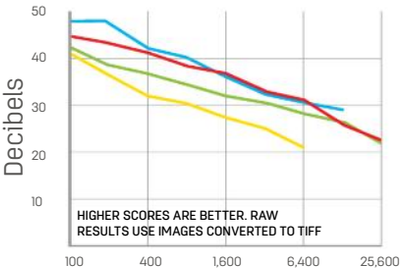
Matt Golowczynski

There's a little noise visible at ISO 200, although this is generally well-controlled throughout much of the sensitivity range

COLOUR ERROR

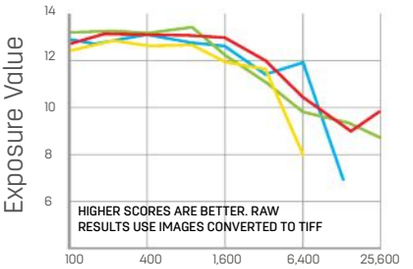
In the default settings, colours in JPEGs are measured to be more accurate than most of the X-Pro2's peers and even the X-Pro1, just slightly behind the Sony Alpha 7 II.

RAW SIGNAL-TO-NOISE RATIO



While the X-Pro2's signal-to-noise ratio is respectable at its base ISO, and relatively consistent across the rest of the range, it's a little lower than those from rival cameras.

RAW DYNAMIC RANGE



Up until ISO 3,200, there's little to split the X-Pro2 from its peers. Things take a slide at and after ISO 6,400, though, where the likes of the Alpha 7 II continue to hold up.

WE SAY...

The X-Pro2 is a worthy update to the X-Pro1. The original's classic styling has been retained and many of that camera's foibles addressed. While a few of the changes aren't entirely for the better, the X-Pro2 is a much more capable tool for a broader range of genres, particularly moving subjects.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★½☆
OVERALL	★★★★☆

CABLE RELEASES

If you're capturing long exposures or macro shots, a remote release is a must

www.canon.co.uk

Canon Remote Switch RS-80N3

£43/$47

Canon's remote feels much like cheaper rivals, but its shutter lock mechanism is marginally more precise. An 80cm cable length is nothing special, suggesting the extra cash is going on the branding.

OVERALL ★★★½☆

www.fujifilm.eu/uk

Fuji Remote Release RR-90

£36/$30

Apart from cost, all our remotes are closely matched, although Fujifilm's version has an especially accurate – if loud – shutter button. It lines up with the Canon as average yet overpriced.

OVERALL ★★★½☆

www.hahnel.ie

Hähnel Remote Shutter Release HRC 280

£20/$30

As with all our contenders, the Hähnel remote has a two-stage shutter release with lock-out for long exposures. But this option also has an interchangeable cable system and a two-metre extension cord.

OVERALL ★★★★½

http://uk.hama.com

Hama DCC Base Cable Remote Release

£15

This remote is almost identical to Hähnel's offering, but the cord is tiny and doesn't plug into your camera. Instead you choose an additional cable to suit your camera model, adding versatility, but also £10 to the price.

OVERALL ★★★★½

www.nikon.co.uk

Nikon MC-DC2 Remote Control

£30/$27

This is the joint-smallest remote on test, measuring 8cm long, yet it sports a generous 105cm cable. However, even these revolutionary features can't hide that this is a generic design with a premium price.

OVERALL ★★★½☆

www.phottix.com

Phottix Wired Remote

£15/$16

As with the Hähnel and Hama remotes, this Phottix can be bought with Canon, Nikon, Sony, Olympus or Panasonic connections. The remote itself is essentially the same as the Nikon MC-DC2, so why pay more?

OVERALL ★★★★★

INSTANT CAMERAS

Six instant shooters perfect for party snappers or retro artists

www.fujifilm.eu/uk/

1 Fujifilm instax mini 70

£99/$99

CHEAP and cheerful, the instax mini 70 is a cost-effective way to get into instant photography. Ours came in canary yellow, but you can also get it in passion red, stardust gold, midnight black, moon white and island blue. As these names suggest, it's a party camera, but it's really easy to use – you just turn it on and start shooting.

The only thing you need to be careful of is that you don't obscure the flash with your finger when you're taking shots vertically. Everything else is taken care of – focusing, exposure and flash are all fully automatic. The inability to control the flash manually can be a bit of an annoyance – you'd need the more expensive mini 90 for that – but you do get a selfie mode and even a tiny selfie mirror on the front. The direct vision viewfinder is a little cramped, but effective enough.

It's maybe not the kind of camera you'd use for analogue 'art' projects, but we really liked the instax 70 as a simple party accessory – and the results are just as good as those from the other instax mini cameras, including the Leica Sofort.

OVERALL ★★★★★

www.fujifilm.eu/uk

2 Fujifilm instax wide 300

£99/$95

BIG hardly covers it. The instax wide 300 is the size of an old-fashioned medium-format rangefinder camera, even a small folding field camera. It's because it uses instax wide film packs rather than the regular instax mini. The film costs twice as much, but each instant print is twice the size; this is the closest you can get to old-style Polaroid print sizes but with modern instax film technology.

The instax 300 wide might look big and clumsy but it's light, and the generous grip makes it easy to hold and use. You power up with a spring-loaded switch around the shutter release, which extends the 95mm lens. The instax wide format is much larger than a digital sensor, so this equates to a moderate wide-angle lens.

For a big camera, though, the instax wide 300 has a tiny viewfinder. It takes practice even to get your eye lined up with the eyepiece. Otherwise, it's simple to use and delivers very good results. Where the regular instax mini format produces small photo 'tokens', these are more like proper photographs. The instax wide 300 is also good value.

OVERALL ★★★★½

uk.impossible-project.com

3 Impossible I-1

£315/369

RESEMBLING a cross between a plastic pyramid and a spaceship from *Close Encounters of the Third Kind*, the Impossible I-1 is the only new camera for the original Polaroid film. The lights around the lens form a 'ring flash' for softer portrait lighting, and the whole camera is a curious amalgam of old-school chemistry and new-fangled technical wizardry.

It even comes with a free I-1 app for your smartphone. You can use this as a remote trigger, a noise trigger and a self-timer. The app also allows double exposures, light painting, and aperture and shutter speed adjustment – and it works as a photo scanner too. This makes the I-1 an excellent tool for experiments in instant photography, but too cumbersome for informal party shots.

The shape doesn't help – this is a bulky camera to carry around. The battery in our sample lost its power far too quickly as well: the battery was flat practically every time we went to use the camera. The cost and slow development time of Impossible Project's film technology is another drawback.

OVERALL ★★★½

FIVE FILMS TO CHOOSE FROM...

1 INSTAX MINI The most common instant film format, producing pictures measuring just 62 x 46mm.

2 INSTAX WIDE Twice the size of instax mini and twice the price, but photos measure a meatier 99 x 62mm.

3 POLAROID SX-70 Not all Polaroid instant film is the same. The SX-70 film has a lower sensitivity.

4 POLAROID I-TYPE Designed for use in the Impossible I-1, I-Type film packs don't have batteries built in.

5 POLAROID 600 Film designed for Polaroid 600-type cameras. It can also be used in the Impossible I-1.

Digital Camera ★★★★★ EDITORS CHOICE

uk.leica-camera.com

4 Leica Sofort

£229/$299

LEICA making an instant camera? That's like Bentley making a moped. But Leica is deadly serious with the Sofort – and it's not bad at all. It's chunky and solid, and although it's made of plastic, it's good plastic. It comes in a choice of mint, orange and white, and takes regular Fujifilm instax mini film packs, although Leica supplies its own film packs too, which produce a warm white frame around each picture.

Pressing the power button on the back extends the lens and, provided you have a film pack inserted, you're ready to shoot. You compose shots using the small direct-vision viewfinder in the top left corner on the back of the camera. It's not very big, but it's usable enough. For an instant camera, the Sofort offers a lot of control, with Macro, Bulb, Self timer, Party & People, Sport & Action, Double Exposure and Selfie modes – in addition to fully automatic operation. You can also turn the flash on and off. The Sofort is expensive compared to the Fujifilm instax mini 70, despite using the same size of film, but it was the most popular model around the office.

OVERALL ★★★★☆

www.lomography.com

5 Lomo'Instant Automat

£129/$199

SOUTH Beach in California is, we imagine, the inspiration for the Lomo'Instant Automat South Beach edition. It's a quirky hipster throwback that is never going to fade into the background. But while it is just a tiny bit mad on the outside, it's pretty conventional on the inside, packing regular Fujifilm instax mini film.

It's not just the styling that makes this South Beach edition different – it also comes with a selection of accessories, including a lens cap that doubles as a wireless shutter release (there's a slot for a button cell in the cap), a close-up lens, a wide-angle lens, a fisheye lens, and an object called a Splitzer. This isn't an interchangeable-lens camera – these are just accessories that clip on the front.

The Automat is simple to use, with a power switch around the lens barrel that also operates the three-position zone focusing. The viewfinder is small, but easy to find with your eye, and exposure is automatic. It's nicely made, although some of the icons on the back are hard to decipher, the full accessory kit pushes up the price... and will you really use it all?

OVERALL ★★★★☆

uk.impossible-project.com

6 Polaroid SX-70

£385/$499

AMAZING to look at even now, the Polaroid SX-70 (refurbished and sold by the Impossible Project) is a real blast from the past. Even unfolding it for use is an adventure. There is a knack: you have to pull up on both ends of the viewfinder panel on the top until the internal latch is released, and the whole of the top of the camera opens out on a set of bellows.

It's an ingenious system because you even get through-the lens viewing and focusing via a pop-up eyepiece on the rear of the viewfinder housing and a split-image rangefinder. It's a bit dark, but it is at least a 'proper' viewfinder.

You adjust the focus with one dial on the front of the camera and the exposure compensation with another – the new Impossible Project film has a different sensitivity to the original emulsion. The camera is great, but the film is expensive for experimenting with (each pack has a battery built in) and the 30-minute development time is so long that this camera is actually far from 'instant'. You also need to make sure you get the proper SX-70 film, which has a lower sensitivity than the others.

OVERALL ★★★☆☆

CSC http://uk.leica-camera.com

Leica M-D (Typ 262)

£4,650/$5,995

Rediscover the joy of anticipation with the digital rangefinder camera that comes without a screen...

SPECIFICATIONS

Sensor _ 24MP full-frame CMOS sensor (23.9 x 35.8mm)
Focal length conversion on lens _ 1x
Memory _ SD/SDHC/SDXC card
Viewfinder _ Direct vision with framing guides
Max video resolution _ N/A
ISO range _ 200-6,400
Autofocus _ Manual, via rangefinder
Max burst rate _ 3fps
Screen _ N/A
Shutter speeds _ 60-1/4,000 sec, Bulb
Weight _ 680g (body only, with battery)
Dimensions _ 139 x 42 x 80mm
Power supply _ BP-SCL2 lithium-ion battery (supplied)

This camera has caused a great deal of controversy in the Digital Camera office

YES, it's true: the Leica M-D really doesn't have a rear display. The back of the camera is taken up instead by a large ISO setting dial. The direct-vision optical viewfinder shows you nothing but the scene in front of the camera, a set of frame guides for your current lens and the bare minimum of exposure and status information.

This camera has caused a great deal of controversy in the *Digital Camera* office. Some folk think it's an absurd affectation, a perverse gimmick dreamed up by an overactive marketing department. Others – those who have gone out shooting with the M-D, in fact – tend to form a different impression.

You can't look at the photos you've shot with the M-D until you get back to base and transfer them on a computer. You can't check the exposure, the composition or the sharpness as you shoot. Does that sound terrifying? Well, it's how we all used to shoot in the days of film – and we managed all right then.

In fact, Leica has a point here. You can't check your photos, so you devote all your attention to shooting them. You have to trust the camera – and yourself – to get them right, but that's part of the craft of photography.

1 Behind this small window is a rotating mirror that produces the rangefinder focus image.

2 The M-D has a direct-vision viewfinder. It's a separate viewfinder that does not show the view through the lens.

3 No, there's no LCD! The space where it would be is occupied by an ISO dial.

4 For those used to today's giant primes, the M-D's lenses look tiny.

Features

The removal of the screen is the M-D's key feature. Otherwise, it's essentially a Leica M (Typ 262). You get a 24-megapixel full-frame CMOS sensor – not a lot by today's standards, but perfectly adequate for this camera's needs – but no video or Live View. The sensor is also designed to work with Leica's extensive collection of lenses from the analogue era, and not just modern digital glass. The maximum ISO is 6,400 – again, not that high, but bear in mind that Leica's lens range is populated by fast primes in the f/1.4 to f/2 range.

Image processing is carried out by Leica's own Maestro processing engine, and pictures are saved as DNG files only. The Leica M-D does

not shoot JPEGs, so the 'look' of your photos is down to what you do with your raw files.

Build and handling

Shooting with a Leica M-series rangefinder is unlike anything else. The viewfinder is a separate unit and does not show you the view through the lens. You see the same angle of view regardless of the lens you fit, so you have to remember to use the brightline framing guides in the viewfinder, which change according to the lens.

Then there's the unique rangefinder focusing mechanism. You focus by lining up a small 'ghost' rectangle in the middle of the viewfinder. When it's superimposed exactly on the image, your subject is in focus. It relies on a mechanical linkage between the lens's focus ring and a small rotating mirror behind a little window on the front of the camera. It sounds like it can't possibly be accurate, but it is – even with the Summilux 50mm wide open at f/1.4.

The only issue is that the mirror image isn't always very easy to see, and it works best when there are clear edges in the subject you're focusing on. Patterned surfaces are especially tricky. You also have to remember to focus before each shot.

Or maybe not. Leica lenses have a long focus travel, with a clear distance scale and depth of field index markers for each lens aperture. It's straightforward to set the camera to specific focus distances with a high degree of accuracy, and to use zone focusing and hyperfocal focusing so that you don't need to focus at all – something that's practically impossible with modern zooms and short-focus-travel primes.

The M-D feels heavy for its size. The lenses are tiny by modern standards, but reassuringly solid and with a silky-smooth focus movement. It's rather easy to move the aperture ring by mistake when your fingers are looking for the focus ring, but that's just a question of familiarisation.

The controls are super-simple. Each lens has an aperture ring, and you control the shutter speed with a dial on the top of the camera. If you want the camera to take care of the exposure for you, just set the shutter speed dial to 'A' to switch it to Aperture Priority mode. (There is >

1 **Contrast rendition**
The M-D produces rich, contrasty images, but you can pull back some shadow and highlight detail when you process its DNG files.

2 **Detail**
The 24MP sensor delivers the level of detail you'd expect, but the Summilux 28mm f/1.4 lens used here excels at all apertures.

3 **Colour**
The colour is what you make it! The M-D shoots raw DNG files only, not JPEGs, so the processing is in your hands alone.

Meet the rivals...

The cameras taking on the Leica M-D...

FOR MORE CAMERA REVIEWS, VISIT www.techradar.com/cameras

Fujifilm X-Pro2
£1,349/$1,699
Fujifilm's Leica-like X-Pro2 has a smaller APS-C sensor, but comes with a much smaller price tag and some great prime lenses in the range. Worth a look.
Reviewed Page 60
★★★★½

Leica Q
£3,400/$4,250 (28mm f/1.7 lens built-in)
Expensive by normal standards, the Q is a bargain for a full-frame Leica. Its Summilux 28mm f/1.7 lens is a beauty.
Reviewed Issue 169
★★★★★

Olympus Pen-F
£899/$999
The Pen-F combines retro chic with cutting-edge tech. Outside it has old-school controls; inside it has a new 20MP Micro Four Thirds sensor.
Reviewed Page 86
★★★★½

Leica lenses have a reputation for beautiful rendering, which this shot exemplifies.

no Shutter Priority or Program mode on the Leica M-D.)

Bizarrely, our test camera didn't power down automatically when not in use. This caught us out a few times: we went to use the camera to find the battery was flat. Even if you do remember to switch it off, it's easy to flick the power switch by mistake as you put it in your camera bag.

There is one more piece of oddball Leica design to mention: to remove the memory card or battery, you have to unhook and remove the baseplate each time. This is an echo of the old Leica film cameras, where you had to remove the baseplate to take out the film canister.

Performance

We can't talk about the autofocus, because there isn't any, or the white balance: the M-D only shoots raw. The manual focus is as accurate as you are. The exposure system does a good job, favouring highlight detail over shadowed areas, which is what most keen photographers would prefer. The continuous shooting speed of three frames per second is unremarkable to say the least, but this isn't a sports camera.

The images have a distinct 'look', however, which could be due to Leica's Maestro image processor or the particular optical quality of Leica's lenses. Images are sharp and contrasty, and the Summilux 50mm f/1.4 in particular delivers beautifully defocused backgrounds. The M-D and its lenses produce a very appealing 'filmic' look.

There's nothing in its technical performance from the point of view of resolution or noise that makes the

The M-D's metering system favours highlight detail – you can bring out the shadows later if you need to.

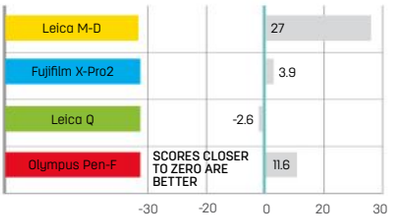
M-D stand out from a crowd of other 24-megapixel full-frame cameras, but there is something in the way it renders images that sets it apart – that and the unique shooting experience of Leica rangefinders.

This won't suit everyone. Ben Brain, *Digital Camera's* editor, finds it quite natural. I don't. I did, however, quickly appreciate the way the Leica M-D makes you think and shoot. First, it stops you pixel-peeping after every shot, simply because you can't. Second, it makes you think about focus, shutter speed and aperture much more clearly.

Third, by taking away the compositional precision offered by regular digital cameras, it makes you look for something else – instead of photographing how things look, you start to photograph things that are happening, which is the essence of documentary photography. Perhaps this is the bottom line. It's not what the Leica M-D does that makes it special, but what it makes you do.

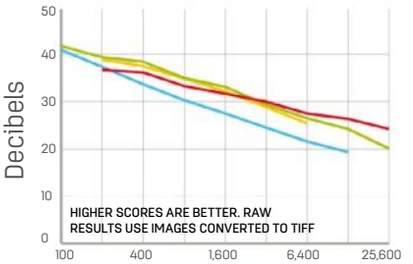
Rod Lawton

COLOUR ERROR



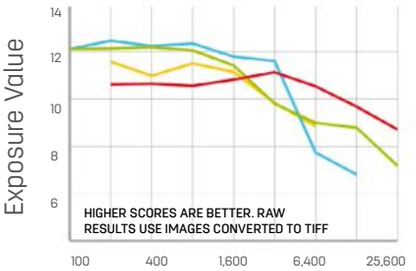
The M-D looks far less accurate than its rivals – but how your raw files turn out depends on how you process them. We used Camera Raw; other software may yield different results.

RAW SIGNAL-TO-NOISE RATIO



The M-D sits pretty much in the middle of the range. Real-world shots at ISO 200 look clean, and the maximum ISO is just 6,400, so the image quality has not degraded badly.

RAW DYNAMIC RANGE



The M-D's DNG files look dense and contrasty when first opened in Adobe Camera Raw, and the dynamic range is adequate. You may need to work on bringing up the shadows.

WE SAY...

The Leica M-D is tricky to rate. Normally, you could add up the sub-scores below to arrive at the final rating, but the fact is that the M-D is bad at some of the things we score for while being brilliant at things we don't. It's a unique and challenging camera that you will find either inexplicable or inspiring.

VERDICT

FEATURES	★★★☆☆
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★☆☆
VALUE	★★☆☆☆
OVERALL	★★★★½

PANORAMIC HEADS

Want to capture panoramas properly? You'd better get a head

www.amazon.com

Fotga Pro 360° Swivel Panoramic Tripod Head

£25

This shoestring-budget head will help you shoot spherical panoramas, but it's riddled with build-quality bugbears and lacks precision. Even so, you can get acceptable results with patience.

OVERALL ★★☆☆☆

www.gigapan.com

GigaPan Epic Pro

£900/$995

The Epic Pro pans your camera in precise increments and across multiple rows, letting you create huge gigapixel panoramas. It's easy to use and works a treat, although portability is not its forte.

OVERALL ★★★★☆

www.gitzo.com

Gitzo Panoramic Disc Series 3

£249/$310

The Panoramic Disc is a basic single-axis pan head, yet it oozes quality, smoothness and precision. Two bubble levels add to the convenience, but this head falls short on value and versatility.

OVERALL ★★★☆☆

www.manfrotto.com

Manfrotto 303SPH

£409/$550

Adjustment is king with the 303SPH: it's packed with positioning options to help you shoot accurate spherical scenes. It's just a shame the design is unwieldy, and it weighs a whopping 2.1kg.

OVERALL ★★★★☆

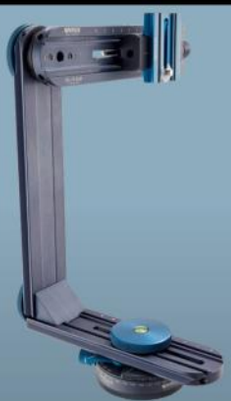
http://shop.nodalninja.com

Nodal Ninja 3 MKII

£198/$180

This head is great for spherical scenes and is a pleasure to use thanks to quality build and materials. It also packs small and weighs just 475g, although it's best suited to smaller SLRs and CSCs.

OVERALL ★★★★★



www.novoflex.com

Novoflex VR-System Slim

£450/$825

This is a beautifully built head for spherical panoramas, and collapses for increased portability. You also get incremental panning click stops, but the Nodal Ninja still has the edge on value.

OVERALL ★★★★☆

SLR www.nikon.com

Nikon D7200

£849, $997 (body only)

The Nikon D7200 replaces the D7100 - the body's roughly the same but there are key upgrades. ***Amy Davies*** *checks it out*

SPECIFICATIONS

Sensor 24.2-million-pixel
Focal Length 1.5x
Memory 2 x SD / SDHC / SDXC
Viewfinder Eye-level pentaprism viewfinder; 100% field of view
Video resolution Full HD (1,920 x 1,080) at 60, 50 (1.3x crop mode), 30, 25 or 24p
ISO range 100-25,600 (expandable to 102,400 equivalent, monochrome only)
Autofocus points 51
Max burst rate 6fps (DX), 7fps (1.3x crop)
Screen 3.2 inch, 1,229k-dot fixed TFT LCD
Shutter speeds 1/8,000–30 sec
Weight 443g 765g (body only, with battery and memory card)
Dimensions 136 x 107 x 76mm
Power supply EN-EL15 rechargeable Li-ion battery

The optical viewfinder is bright and clear. It's great to see a 100% offering on a camera at this level

ROUGHLY two years after the introduction of the D7100, the new D7200 which replaces it seems more like an incremental upgrade than a major overhaul. Inside the camera you'll find a sensor with the same 24-million-pixel resolution as its predecessor, while the external body is identical.

As before, the sensor is missing an anti-aliasing filter, which should again make it extremely capable of resolving fine detail. That's not to say that some of the changes that have been made are not significant, though.

Above The D7200 looks like the D7100's identical twin – apart from the name badge.

Features

An Expeed 4 processor facilitates an increase in burst depth: Nikon says that the D7200 is capable of shooting up to 27 raw-format files or 100 JPEGs before the buffer fills. There's also an increase in native sensitivity range: it's now ISO 100-25,600, with two special monochrome-only expansion settings which take the sensitivity up to ISO 102,400.

Also included for the first time in a DX format (APS-C) Nikon is the ability to focus down to -3EV, thanks to the inheritance of the Multi-Cam 3500-II 51-point autofocusing system from models that are higher up in Nikon's range.

The D7200 now includes Wi-Fi and, for the first time in a Nikon digital SLR, NFC (Near Field Communication) connectivity. The two wireless technologies should make it easier than ever to establish a remote shooting connection with your phone or tablet, or send pictures across for quick sharing.

Staying the same as in the D7100 is a 3.2 inch, 1229k-dot LCD screen, which is fixed and not touch-sensitive. It is joined by an eye-level pentaprism optical viewfinder, which offers 100% coverage.

Build and handling

Nikon has worked hard to make the D7200 look and feel like a high-quality piece of kit. It feels pretty similar to something like the D610 or the D750 when you're holding it. Both the front and rear grip have soft textured coatings, which make it feel nice in the hand, while your fingers sit comfortably thanks to its contoured and shaped grip.

As with the D7100, the D7200 is weatherproof, which gives you the

Zooming in on the... NIKON D7200

Drive mode dial
Choose a drive mode by holding down this small button and rotating the dial. It's a little fiddly, but you get used to it.

AF switch/button
Press the button in the centre to choose an autofocusing method, while the switch can be flicked to choose between manual and auto focusing.

Lock switch
You can lock the control pad using the outside switch – handy for preventing an accidental change to your focus point.

i button
This button acts as a sort of quick menu, but there should be more options available on the menu that pops up.

Fn button
This button can be assigned to one of 18 different settings, and is easily reachable as it's positioned near the grip.

Live view button
Use this to choose between using the viewfinder and the screen to compose your images. The switch allows you to flick between video and stills shooting.

confidence to use it in a range of conditions without concern. It also helps to give it an air of high quality –albeit not feeling quite as rugged as the D810.

This is very much a camera that requires both hands to use and, as we'd expect from this level of camera, there's a good range of dials and buttons for making changes to key settings quickly and easily. If you're a D7100 owner, you will feel extremely familiar with both the button and menu layout, but if you're coming from a different Nikon model, you should also feel at home.

The optical viewfinder is bright and clear. It's great to see a 100% offering on a camera at this level, as it means you'll never have something unexpected creeping into the edges of the frame. When shooting macro or still-life scenes, it's advisable to use the rear LCD screen, which offers a magnified view for checking critical focus. It would be nice if the screen was articulated or tilting, though, to help with awkward angles.

Connecting to a smartphone via Wi-Fi is easy, but the control is hidden away a little in the main menu. A dedicated button for quicker access would have been better. NFC is included – but, despite several attempts, I wasn't able to get it to respond to my Android phone. The Nikon Wireless Utility app is also very limited, only offering the ability to set autofocus point and trip the shutter. Nevertheless, it's useful for group shots, or if you want to shoot from a tricky angle.

Performance

The 24.2MP sensor and Expeed 4 processor combination has already proved itself to be great partnership in the Nikon D5500, which sits underneath the D7200 in Nikon's

Meet the rivals...

The cameras taking on the Nikon D7200

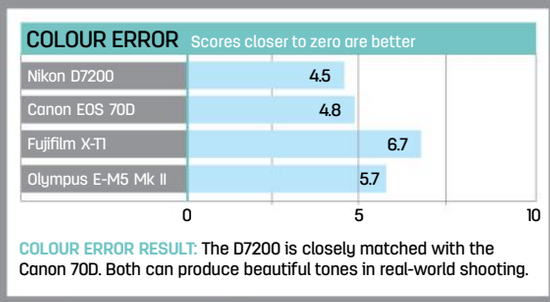
FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon EOS 70D
Body: £729 / $899
A fantastic all-rounder, with Wi-Fi and great image quality. It's also got an articulating touchscreen.
Reviewed Issue 144
★★★★★

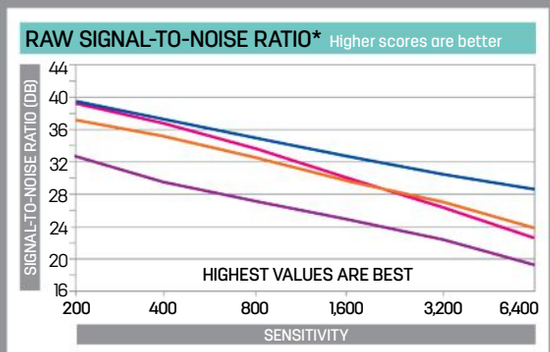
Fujifilm X-T1
Body: £795 / $1,299
Beautiful retro design makes the X-T1 an ideal camera for enthusiasts who like traditional controls.
Reviewed Issue 151
★★★★★

Olympus OM-D E-M5 Mark II
Body: £749 / $899
A powerful CSC with usability that gives SLRs a run for their money and a clever High Res mode.
Reviewed Page 90
★★★★½

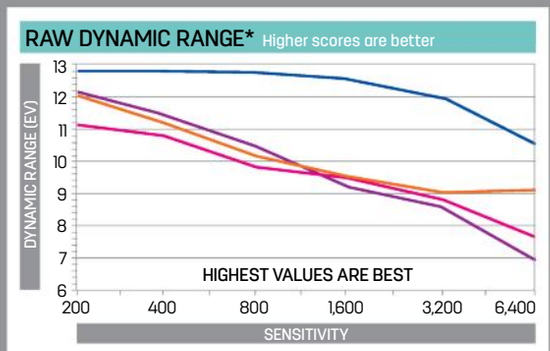
CAMERA BENCHMARKS
How does the Nikon D7200 fare?



COLOUR ERROR RESULT: The D7200 is closely matched with the Canon 70D. Both can produce beautiful tones in real-world shooting.



NOISE RESULT: The D7200 comes bottom here. This could be a result of Nikon's processing favouring detail over noise, though.



DYNAMIC RESULT: The D7200 is fairly closely matched here with the Fujifilm X-T1, but it performs slightly better than the 70D.

OVERALL BENCHMARK RESULT

Unsurprisingly, the D7200 is better at detail resolution than the Canon EOS 70D, while it is very closely matched with the Fujifilm X-T1. Both the 70D and the X-T1 generally perform better than the D7200 for JPEG signal-to-noise ratio, although the Nikon fares better at higher sensitivities. Meanwhile, for JPEG dynamic range, the D7200 and 70D are very closely matched, and are both better than the X-T1.

* Raw results use images converted to TIFF

Above As you can see, the D7200 produces lovely natural tones.

line-up, so we were fully expecting good things from the D7200.

This camera is aimed broadly at enthusiasts, who want to shoot a bit of everything, so it needs to be a fantastic all-rounder, capable of handling lots of different subjects. Looking at JPEG images directly from the camera, colours have a great vibrancy, with a bright but natural appearance. Colours are vivid and bold in good light, but even under different lighting conditions, you still get a nice warmth and saturation.

Detail is also excellently resolved. Examining images at 100% reveals some very fine detail, with pretty much zero evidence of image-smoothing at lower sensitivities. Detail continues to be resolved well throughout the sensitivity range, and even at those incredibly high figures, like ISO 12,800 or 25,600, we can still see a reasonable amount of detail. Even the monochrome-only setting of Hi1 is usable, with the grain arguably adding to the film-like feel of a black-and-white shot. Looking at raw-format files, it's clear that a fair amount of noise reduction is applied to JPEG images in their default settings, but this gives you scope to apply exactly the kind of noise reduction you want to in post-processing, balancing out detail with the presence of noise.

Using the matrix metering system leaves you with well-exposed images in the majority of conditions, and it even copes well with some high-contrast scenes. On occasion, you may find dialling in some exposure compensation for dull landscapes helps to bring out detail, though.

The automatic white balance system copes very well with different lighting conditions, and is pretty much faultless in daylight or cloudy conditions. It errs ever so slightly on the warm side under artificial lighting, so it's recommended for accuracy that you switch to a more appropriate white balance setting, or create a custom setting.

Autofocusing is a breeze with the

The automatic white balance system copes very well with different lighting conditions

Above The Hi1 ISO setting is accessible only in the JPEG Monochrome mode, but its results are atmospheric.

D7200. Thanks to the new AF system, the camera is capable of locking onto a moving subject, even in lower-light conditions. The 15 cross-type AF points are more sensitive in lower light, while the central point is the most sensitive of all if light levels drop even further.

The camera's burst depth is now much improved when compared with its predecessor. Shooting with Fine JPEG selected allows you to capture around 50 shots before the buffer fills; this equates to around nine seconds of shooting time, giving you plenty of opportunity to catch the action. Raw-format shooting at 14-bit gives you roughly 2–3 seconds, or 4–5 seconds at 12-bit, if you need the higher-quality files.

Verdict

Although the D7200 may not be a complete overhaul, Nikon has tweaked an already great camera to produce something that is even better than its predecessor.

The D7200 makes for a great all-rounder. It produces images that are very sharp and detailed, with a pleasing degree of saturation.

While it would be nice to see an articulating, or perhaps even touch-sensitive, screen, as we have on the D5500, it's great to have a 100% viewfinder to use.

The Expeed 4 processor fixes the issue of burst depth, making it more useful than before if you're shooting quick-moving subjects. The handling of the camera also remains great, with a high-quality feel you might otherwise expect from something that sits at the top of Nikon's range, rather than in the middle.

You won't find a dedicated Wi-Fi button: its activated via the menu.

WE SAY...

A comprehensive feature set and great quality images make the D7200 the ideal camera for enthusiasts – or maybe even a back-up model for those who already own a full-frame Nikon.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★★
IMAGE QUALITY	★★★★★
VALUE	★★★★☆
OVERALL	★★★★★

Stick or twist? Upgrade advice

If you already own a D7100 (pictured) or a D7000, there are a couple of additions here that may tempt you to upgrade, especially if you're a sports or wildlife photographer and need a better burst depth, or perhaps if you often shoot in low light and would like the higher native ISO range. Otherwise, it's a slightly trickier decision, as many of the features have stayed the same. For those looking to move from something lower down in Nikon's line-up, such as D5300, this makes for an excellent upgrade.

SLR www.nikon.com

Nikon D500 £1,729/$1,999

The D500's specs look amazing. We find out how Nikon's new SLR shapes up in real-world use

SPECIFICATIONS

Sensor _ DX-format CMOS, 20.9MP
Crop factor _ 1.5x
Memory _ 1 x SD, 1 x XQD
Viewfinder _ Optical pentaprism, 1x magnification, 100% coverage
Video resolution _ 4K (UHD) 3,840 x 2,160 pixels at 30/25/24fps, Full HD 1,920 x 1,080 pixels at 60/50/30/25/24fps
ISO range _ 100-51,200, expands to 50-1,640,000
Autofocus points _ 153, including 99 cross-type; 15 points sensitive down to f/8
Burst rate _ 10fps
Max buffer capacity _ 200 shots
LCD screen _ Tilting 3.2-inch touchscreen, 2,359,000 dots
Shutter speeds _ 1/8,000 sec to 30 sec, Bulb, timer, sync 1/250 sec
Weight (body only) _ 760g
Dimensions _ 147 x 115 x 81mm
Power supply _ EN-EL15 battery

Above The D500 has two card ports: one that's compatible with SD-type media and another that accepts XQD media. An XQD card is required to get the maximum 200- image burst depth in the specifications.

NIKON is one of the world's top digital SLR makers, but for some time it's had a big gap in its camera line-up. Canon has an affordable high-speed, professional-quality APS-C format digital SLR for enthusiasts in the EOS 7D Mark II, but Nikon's had nothing to match it. There was the much-loved Nikon D300S, but that was discontinued long ago. So for Nikon users, the D500 is very big news indeed. The spiritual successor to the D300S has the same rugged build but much faster 10fps continuous shooting, a high-tech 153-point autofocus system and 4K video.

The D500 delivers more than many had hoped for: it's much more closely aligned with Nikon's pro-level full-frame camera than the D300 was. Apart from the fact that it has a DX- rather than an FX-format sensor, the D500 has a similar specification to the D5. This makes the D500 a much more affordable route to high-end technology, giving you the best that Nikon has to offer in terms of autofocus, white balance and metering performance in a body that weighs much less than a D5.

1 The D500 is like a DX-format version of the flagship Nikon D5. It can use both DX (APS-C) and FX (full-frame) lenses.

2 The high-res 2,359k-dot rear screen is touch-sensitive and mounted on a tilting mechanism.

3 Nikon has really stepped up its video game, offering 4K video (actually 3,840 x 2,160 UHD) at up to 30 frames per second.

Features

One surprising fact about the D500 is that its APS-C format sensor has 20.9 million effective pixels, fewer than Nikon's other recent (24-megapixel) SLRs of the same format. The D5, announced at the same time, has 20.8 million pixels on its full-frame sensor, and the two cameras use the same sensor architecture.

Having the same pixel count as the D5 but on a smaller sensor means that the D500's photo receptors are smaller. This naturally has an effect on their light-gathering power and low-light performance. Consequently the D500 doesn't have quite the same crazy sensitivity range as the D5; its

1
Noise
Noise levels are good, right through the standard ISO range. It's only at ISO 25,600 and above that noise starts to become obvious.

2
Resolution
The 20MP sensor is technically down on resolution compared to Nikon's existing 24MP APS-C sensor, but detail rendition is excellent.

3
Exposure
Nikon's default Matrix metering system produced accurate exposures in a wide range of conditions, and the auto white balance system worked well too.

standard range is ISO 100-51,200, and there are five expansion settings taking it up to the equivalent of ISO 1,640,000 – a stop lower than the D5's maximum, but still an incredibly high figure.

There are many other similarities between the two new cameras, all of which make the D500 an exciting proposition. The Expeed 5 processor is the same, for example, as is the new 153-point Multi-Cam 20K autofocus system with 99 cross-type points. The processing engine also brings a maximum continuous shooting rate of 10 frames per second (the D5 can hit 12 frames per second when shooting normally) for up to 200 14-bit lossless compressed raw files – a staggering feat by any measure. It makes the D500 enticing for sports photographers.

Whereas the D5's 4K shooting capability is limited to three minutes, it's possible to shoot 4K UHD (3,840 x 2,160) 30p/25p/24p video for up to 29 minutes and 59 seconds with the D500. 4K UHD time-lapse movies can be created in-camera, and there's electronic Vibration Reduction to reduce camera shake when shooting movies hand-held.

Another feature that distinguishes the D500 from the D5 is Nikon's new SnapBridge technology, which allows the camera to stay permanently linked to a smart device via a low-power Bluetooth connection (or Wi-Fi). After the first connection has been made, images can be transferred automatically to your phone whenever you shoot.

The D500 has two card slots. One accepts SD cards, while the other is for the faster XQD format. Although they've been around for quite some time, XQD cards haven't quite become commonplace yet, but this could be about to change.

Meet the rivals...

The cameras taking on the Canon 80D...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon EOS 7D II
£1,249/$1,349
The 7D II is a good choice if you're a Canon shooter after a camera like the D500 – although the D500 edges ahead on paper.
Reviewed Page 30
★★★★★

Nikon D7200
£849/$997
The D7200 is the next model down in Nikon's DX range. It has more megapixels but can't match the D500's continuous shooting and AF.
Reviewed Page 70
★★★★☆

Sony Alpha 77 II
£999/$998
This 24MP SLT has an electronic viewfinder, along with an AF system that's fast and accurate even in low light.
Reviewed Page 114
★★★★☆

Above The D500 is a bit more discreet than the D5, which can come in handy for candid shooting.

Left A labrador bounding erratically around the frame proved to be a challenging subject, but it was rendered pin-sharp as long as the active AF point was over the dog.

The majority of images are well exposed, have attractive, accurate colours and are sharp... Its low-light performance is very good

Build and handling

Although the D500 doesn't have a full metal body like the D5, its metal chassis is more durable than that of the D300S. The degree of sealing is greater, too, so the camera can be used in harsher conditions. Nikon has also omitted a pop-up flash to make the camera sturdier, and the hotshoe is protected with a weatherproof seal.

The camera certainly feels solid, without having the weight of its full-frame sibling. On the front is a decent grip with a textured coating; a ridge on the back marks the thumb rest, making for a comfortable holding experience.

All the direct controls that you would expect are present, along with a ridged mini-joystick controller for selecting the AF point quickly when the camera is held to your eye. This sits just to the left of the resting position for your thumb on the back of the camera. A little lower down is the familiar rocker-style navigation pad, with a central button for scrolling through the menu and making settings selections.

Like the D5, the D500 has a 3.2-inch 2,359,000-dot screen that's touch-sensitive. Settings can't be selected nor the menu navigated by touch, but it's possible to enter text, set the AF point or scroll through and zoom into images with taps and swipes on the screen. The screen is responsive, but it would be nice to be able to use it a bit more.

The screen's high resolution means that image previews are very sharp, and there's plenty of detail visible. The tilting bracket is one of the most rugged-feeling I've used.

As with some other Nikon SLRs, including the D5, it frustrates me that the Information screen brought up by pressing the Info button isn't interactive, and that the options revealed by pressing the i button aren't customisable. That aside, the D500's control arrangement is great. When walking with the camera on a strap over my shoulder, however, I frequently found that the Focus selector lock (around the navigation control) had activated accidentally, and I had to turn it off before I could change AF point.

As usual with a high-end camera, Nikon has opted for a pentaprism viewfinder for the D500. This provides a 100 per cent field of view when shooting in DX format, or 98 per cent when shooting with the 1.3x magnification option selected. The view is nice and bright, and the blackout time when you're shooting at the maximum frame rate is very brief, so it's easy to keep up with fast-moving subjects.

Performance

The D500 does most things well most of the time. The vast majority of images are well-exposed, have

Above Even in a gloomy underpass, the D500's AF system proved to be fast and accurate.

attractive, accurate colours and are sharp. Video quality is also high.

Examining images in more detail reveals that its low-light performance is very good within its native sensitivity range. Images taken at the lower sensitivity settings have lots of detail, achieving excellent scores in our resolution tests. This starts to drop off at ISO 6,400, but the results at ISO 12,800 are still very good, and there's just a hint of chroma noise in raw files viewed at 100 per cent on-screen. This coloured speckling becomes more obvious from ISO 25,600, but it's well within acceptable limits.

The lowest expansion setting, Hi 1 (ISO 102,400), is pretty good for such a high value, but banding starts to creep into images shot at Hi 2 (ISO 204,800) and it's visible in the darker areas of images sized to A4. It's not worth using the values above these two settings, as there's lots of noise and subjects become lost in the murk.

Sports and action photographers are unlikely to be disappointed by the D500's fast and accurate autofocus performance. It adjusted focus quickly when I shot skateboarders in London's gloomy Undercroft on the South Bank and kept track of them effortlessly. A bounding labrador proved a more challenging subject, but it was rendered sharp as long as the active autofocus point or group was in the right place.

The contrast-detection autofocus system that operates when the camera is in Live View or video mode also seems a little better than the ones in Nikon's other DX-format cameras. Even in bright light there's some backward and forward adjustment before the subject is sharp, but it doesn't get much worse in low-light conditions. It can be used hand-held, though moving subjects are best avoided.

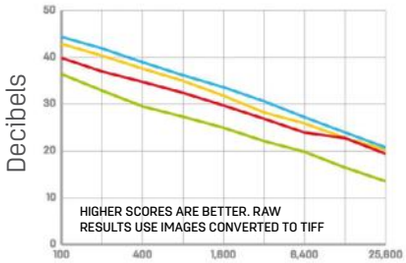
The D500's automatic white balance and metering system didn't throw up any unpleasant surprises. The general-purpose Matrix metering system put in a solid performance, recommending balanced exposure values in a wide range of situations. It copes well with bright subjects and often doesn't result in the underexposure we might traditionally anticipate.

Angela Nicholson

COLOUR ERROR

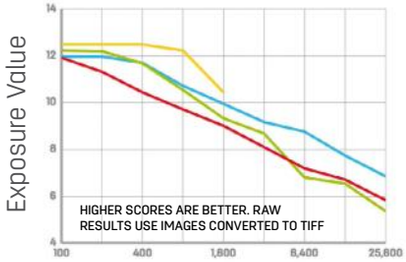
The lab tests indicate that the D500's colour accuracy is one of the best in the group, beaten only marginally by the Sony A77 II and much better than the D7200 or the EOS 7D II.

RAW SIGNAL-TO-NOISE RATIO



The slight drop in resolution compared with the Nikon D7200 brings a big reduction in noise levels. The D500 is near the front of the group, especially at low or mid ISO settings.

RAW DYNAMIC RANGE



The D500 matches the superior dynamic range of the D7200, narrowly shading the EOS 7D II and the A77 II – though differences may be small in real-world shooting.

WE SAY...

The D500 is a dream camera. It has a fast, effective autofocus system, 10fps shooting capability and first-rate metering and white balance systems. For the money, this might be the best digital SLR Nikon has ever made. Its 4K video, high-tech autofocus and overall image quality raise the bar for APS-C SLRs.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★½

HEAD TO HEAD

NIKON D810

VS

PENTAX K-1

The Nikon D810 is an established flagship camera; the Pentax K-1 is the challenger...

PHOTOGRAPHERS looking for a full-frame digital SLR have had to choose between two brands – Canon and Nikon – until now. Pentax has been making APS-C format digital SLRs for years, but this is the company's first foray into full-frame photography.

These two cameras come with very different approaches, however. The D810 is a 'classic' Nikon, with a sturdy build, carefully honed control layout and the backing of a huge range of professional lenses and photographic accessories.

The K-1 arrives with a new approach to camera ergonomics and, thanks to Pentax's powerful SR II lens-shift system, an intriguing collection of features.

Features

The big technical story with the K-1 is this sensor-shift system, which is used for a variety of functions. The most obvious is its five-axis image stabilisation, which should work with practically any lens and corrects a much wider range of movements than the lens-based VR system used by Nikon. Pentax says it can deliver a shutter speed advantage of up to five stops.

Both cameras dispense with the usual anti-aliasing filter in front of the sensor. Removing this filter improves fine detail but risks occasional moiré effects. With the D810 you have to correct any moiré effects later in software, but the K-1's AA simulation mode 'jiggles' the sensor a sub-pixel level during the exposure to simulate a real anti-aliasing filter.

The SR mechanism accommodates a large enough movement range to compensate for skewed horizons with an auto-level mode. Most of the time you can see if the camera is straight, but this feature could be very useful in low light

Interestingly, in addition to the GPS sensor, the K-1 has Wi-Fi built in. Both of these are optional extras on the D810

or when shooting at awkward angles. Then there's the K-1's Astrotracer mode: this uses the camera's built-in GPS receiver to move the sensor to compensate for the movement of celestial objects during astro-photography.

Pentax's Pixel Shift Resolution mode combines four separate exposures taken in quick succession, with a single pixel shift of the sensor between each one. This enables the sensor to capture full red, green and blue colour information at each pixel site – usually, sensors can capture only red, green or blue data for each pixel and have to interpolate (guess) the other colours.

Neither camera is specifically equipped for action photography, but the D810 can shoot slightly faster at 5fps (7fps in DX crop mode), while the K-1 can only manage 4.4fps. The D810 also has a better buffer capacity. The K-1 has the more durable shutter mechanism, with a quoted 300,000-shot shutter life versus 200,000 shots on the D810.

On paper, the D810 has the more sophisticated autofocus system. It uses Nikon's 51-point Multi-Cam 3500FX AF sensor, with dynamic area AF for moving subjects and Nikon's new group-area AF mode. The K-1 has a newly-developed 33-point Safox 12 autofocus sensor with a smaller number of AF points, but they operate over an area of the frame 40% wider than a regular AF sensor.

Interestingly, in addition to the GPS sensor, the K-1 has Wi-Fi built in. Both of these are optional extras on the D810. The K-1 also scores some points with a higher maximum ISO setting of 204,600, whereas the D810 maxes out at ISO 12,800 in its standard range and hits ISO 51,200 in 'expanded' mode.

Build & handling

For anyone used to the layout of high-end Nikon SLRs, the D810 will offer no surprises. There's no mode dial on the top of this model – instead, you change exposure modes by pressing a small >

NIKON D810

1 The D810 accepts both full-frame FX format lenses and APS-C DX lenses. (When you fit a DX lens, it switches to its 15.3MP DX Crop mode.)

2 The D810 doesn't have a regular mode dial. Instead, it uses this control cluster, with buttons for image quality, metering pattern, ISO, white balance and release mode.

3 On the right is a large mono LCD status display for conveying exposure information, shots remaining, battery condition and other settings.

4 The D810's 3.2-inch LCD display has a slightly higher resolution than the K-1's, but it's fixed and non-articulating.

Website	www.nikon.co.uk
Street price (body)	£2,399/$2,797
Image sensor	36.3MP CMOS
Sensor size	35.9 x 24mm full-frame
Max image size	7,360 x 4,912 pixels
Image processor	Expeed 4
Low-pass filter	No
Viewfinder	Pentaprism, 0.7x, 100%
Lens mount	Nikon F
ISO range (expanded)	ISO 64-12,800 (32-51,200)
Autofocus points	51-point (15 cross-type)
Shutter speeds	1/8,000 to 30 sec, Bulb
Flash	Pop-up, hotshoe
Max burst rate	5fps
Image stabilisation	Via lens
Video – max resolution	1080p (24/25/30/50/60fps)
LCD screen	3.2-inch, 1,229k
Memory	1 x CF, 1 x SD/HC/XC
Wireless connectivity	None
Interface	USB 3.0, X-sync, HDMI
Body materials	Magnesium alloy
Body (W x H x D)	146 x 123 x 81.5mm
Weight	980g
Battery life (Cipa)	1,200 shots

PENTAX K-1

1 The K-1 uses its own range of full-frame lenses, but it can also take APS-C Pentax lenses, where it switches automatically to a 'crop' mode.

2 The mode dial has five custom user settings and two additional exposure modes you won't see anywhere else – Sv (sensitivity priority) and TAv (shutter speed and aperture priority).

3 This Smart Dial offers quick access to key functions like exposure compensation, ISO and bracketing. It works alongside the 'e-dial'.

4 The 3.2-inch LCD display is attached via four sliding pivot arms. This enables you to tilt the screen both vertically and horizontally.

Website	www.ricoh-imaging.co.uk
Street price (body)	£1,799/$1,847
Image sensor	36.4MP CMOS
Sensor size	35.9 x 24mm full-frame
Max image size	7,360 x 4,912 pixels
Image processor	Prime IV
Low-pass filter	No
Viewfinder	Pentaprism, 0.7x, 100%
Lens mount	Pentax KAF2
ISO range (expanded)	ISO 100-204,800
Autofocus points	33-point (25 cross-type)
Shutter speeds	1/8,000 to 30 sec, Bulb
Flash	Hotshoe only
Max burst rate	4.4fps
Image stabilisation	In-body
Video – max resolution	1080p (24/25/30fps), 1080i (50/60fps)
LCD screen	3.2-inch Flexi-tilt, 1,037k
Memory	2 x SD/HC/XC
Wireless connectivity	Wi-Fi
Interface	USB 2.0, X-sync, HDMI
Body materials	Magnesium alloy
Body (W x H x D)	136.5 x 110 x 85.5mm
Weight	1,010g
Battery life (Cipa)	760 shots

IMAGE TEST

Detail — Outdoors, the fine detail captured by the K-1 is slightly less crisp than the D810's, though the definition at the edge is better. This comparison used the makers' 24-70mm f/2.8 standard lenses.

Low light — This ISO 6,400 indoor shot shows the performance difference – the K-1's result is crisper and smoother than the D810's. Its five-axis in-body stabilisation gives it a boost in low light.

Colour — The K-1 offers a slightly more robust, saturated colour rendition than the D810, and some outdoor shots show a hint of magenta in bright tones. Overall, though, they are hard to separate.

Exposure — In unchallenging lighting, both cameras produce similar exposure levels. In this shot, the K-1 has paid more attention to the shadows under the bridge, leaving the daylit area over-exposed.

The D810 has a 3.2-inch 1,229,000-dot LCD display. The K-1's LCD display lags behind in resolution at 1,037,000 dots

mode button near the shutter release and turning the command dial.

On the left of the top plate is a four-button control cluster unique to high-end Nikons. There are buttons for setting the image quality, metering pattern, ISO setting and white balance. Around its base is a release mode dial with settings for single-shot mode, low and high-speed continuous shooting, the D810's 'quiet' mode and mirror up modes. The mirror up mode, the D810's delayed shutter release option, an optional electronic first curtain shutter and a smoother-acting shutter mechanism are all designed to get the best possible benefit from its 36-megapixel sensor and go some way towards offsetting the advantage of the K-1's in-camera image stabilisation.

Round the back, the D810 has a fixed (non-articulating) 3.2-inch 1,229,000-dot LCD display. The K-1's LCD display matches it for size but lags slightly behind in resolution at 1,037,000 dots.

The K-1 f has a unique scissor-action screen that pulls out from the back of the camera and can be angled upwards, downwards, left or right. It doesn't give quite the same range of angles as the flip-out vari-angle screens on some SLRs and mirrorless cameras, but it keeps the LCD display on the optical axis of the camera, rather than off to one side.

The K-1 also offers a radically different external control layout to the D810. It features a regular mode dial on its top plate and an additional Smart Dial. The Smart Dial is used to select settings such as exposure compensation, ISO, drive mode, bracketing settings, HDR mode and more. Alongside it is an unmarked 'e-dial', used to change these settings.

Performance

Pentax has made clear progress with its autofocus and lenses, with the result that the K-1 feels smooth and responsive – at least with static subjects. With moving subjects, it couldn't quite match the performance of the Nikon D810's more sophisticated and highly developed 51-point system. Neither camera is really equipped for sports, but the D810 is better at tracking moving subjects. It's

NIKON D810

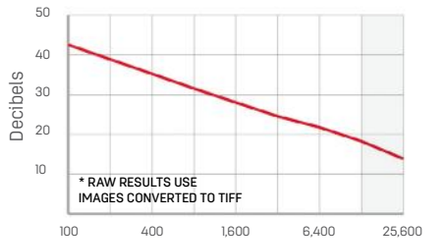
PENTAX K-1

COLOUR ERROR CLOSER TO ZERO IS BETTER

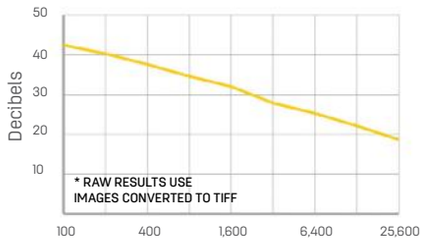
The D810 delivers very accurate colours, subject to the exposure and white balance settings you choose.

The K-1's colour error is higher than the D810's, but it's still low. Images have slightly higher saturation.

RAW* SIGNAL-TO-NOISE RATIO HIGHER IS BETTER; RAW RESULTS USE IMAGES CONVERTED FROM TIFF

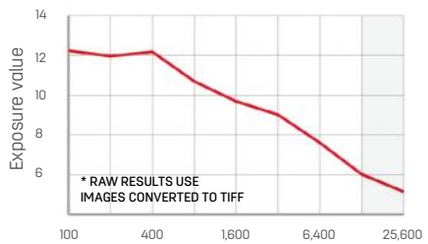


The D810's noise control at low ISOs is good, but its performance falls away at higher settings.

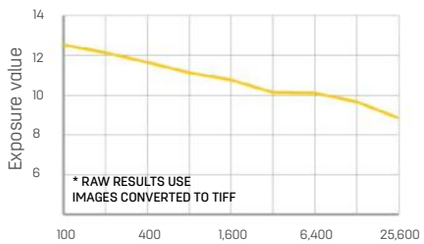


The K-1's noise levels are similar to the D810 at low to medium ISOs, but at higher values it pulls away.

RAW* DYNAMIC RANGE HIGHER IS BETTER; RAW RESULTS USE IMAGES CONVERTED FROM TIFF



The Nikon D810's dynamic range is legendary, though at low ISOs the Pentax K-1 can match it.



The K-1 matches the D810's dynamic range at low to medium ISO settings, but falls away at high ISOs.

☐ Normal ISO range ☐ Expanded ISO range

VERDICT

	D810	K-1
FEATURES	★★★½☆	★★★★☆
BUILD & HANDLING	★★★★★	★★★★☆
PERFORMANCE	★★★★☆	★★★★☆
VALUE	★★★☆☆	★★★★★
OVERALL	★★★★☆	★★★★½

also a little better at burst shooting. While it appears to offer only a small speed advantage over the K-1, it has a better buffer capacity and, if you use its DX crop mode, it can shoot at 7fps.

In poor lighting, the K-1 produces much cleaner, crisper images at higher ISOs of 3,200 and beyond, and its in-body stabilisation is an advantage if you're using Nikon's older, non-stabilised 24-70mm kit lens on the D810. Our hit-rate of sharp shots from the K-1 was much higher than with the D810.

This is a key point when comparing these cameras for value. The K-1 is a lot cheaper than the D810 – and the gap becomes wider when you factor in the cost of comparable 24-70mm f/2.8 kit lenses. The Pentax lens is around £1,100/$1,300, while the unstabilised Nikon 24-70mm f/2.8 costs £1,600/$1,800. The newer, stabilised Nikon 24-70mm f/2.8 VR is an eye-watering £2,000/$2,200.

Where the Pentax K-1 scores highly for high-ISO image quality, you might expect the Nikon D810 to be much closer at lower ISOs. Actually, the Nikon offers no clear advantage. In some instances its fine detail looks slightly better; in others it's hard to see any difference. Indeed, the Pentax 24-70mm lens displays slightly better edge sharpness than its Nikon equivalent in our wide-angle test shots.

For video, the D810 wins out. You probably wouldn't choose either camera if video was your main business, but the D810 offers full HD at up to 60/50p (the K-1 only manages interlaced video at this higher speed), electronic aperture control while filming, and clean HDMI output while recording to internal memory cards.

Rod Lawton

WE can't split these cameras in terms of overall rating, and they have different characters and qualities. The D810 is the safe pair of hands for professionals. It can't match the K-1 for features or low-light performance, but it comes with a big lens and accessory system. Cameras come and go, but lenses are for life, so you need to consider the long-term investment. The D810 has the better autofocus system and it's better for video too.

The K-1 is both better-specified and more of a risk. Pentax has been building up its full-frame lens system, but Nikon still leads here. On the other hand, the K-1's in-body stabilisation, better high-ISO performance, built-in GPS and Wi-Fi, and lower price make it a terrific all-rounder.

SLR www.nikon.com

Nikon D5

£5,099/$6,499

It's a great camera with a fabulous AF system – but forget about using the highest sensitivity setting

SPECIFICATIONS

Sensor _ Full-frame (35.9 x 23.9mm) with 20.8 million effective pixels
Focal length conversion _ 1
Memory _ Dual XQD or Dual CF
Viewfinder _ Optical covering 100%
Max video resolution _ 4K (3,840 x 2,160 pixels)
ISO range _ 100-102,400 expandable to ISO 3,280,000
Autofocus points _ 153 and 99 cross-type
Max burst rate _ 12fps with AF and metering, 14fps without and in live view mode
Screen _ Touch-sensitive 3.2-inch 2,359,000-dot
Shutter speeds _ 30-1/8,000 sec, Bulb
Weight _ 1,235g (body only)
Dimensions _ 60 x 158.5 x 92mm
Power supply _ Rechargeable Li-ion EN-EL18a

Real-world images look cleaner and sharper than those from the D4S

THE D5 takes the top spot from the D4S in Nikon's SLR line-up. It's aimed primarily at professional news and sports photographers, and is designed to take photographs in challenging conditions. It comes equipped with a 20.8MP full-frame sensor and Nikon's Expeed 5 processing engine, which enable a native sensitivity range of ISO 100-102,400, with expansion settings going to ISO 3,280,000. Yes, three million.

In addition there's a 153-point autofocus (AF) system with 99 cross-type sensors and the ability to shoot at up to 12 frames per second, with full autofocusing and metering capability for up to 200 raw files.

Build & handling

Nikon has kept the D5's control layout the same as the D4S. While this makes it easy to swap between the two cameras, there are a few niggles with the handling. Because of differences in the number and position of the controls for horizontal and vertical shooting, you have to adapt the way you control the camera to the orientation you're shooting in.

1 Until a promised firmware upgrade comes, there's a three-minute maximum for 4K video.

2 In review mode, this 3.2-inch, 2,359,000-dot screen is touch-enabled for easy image navigation.

3 Nikon should combine the functions of the Info and 'i' buttons to streamline controls.

4 The D5 has a metal body and extensive weather-sealing; there's even a weatherproof cover for the hotshoe.

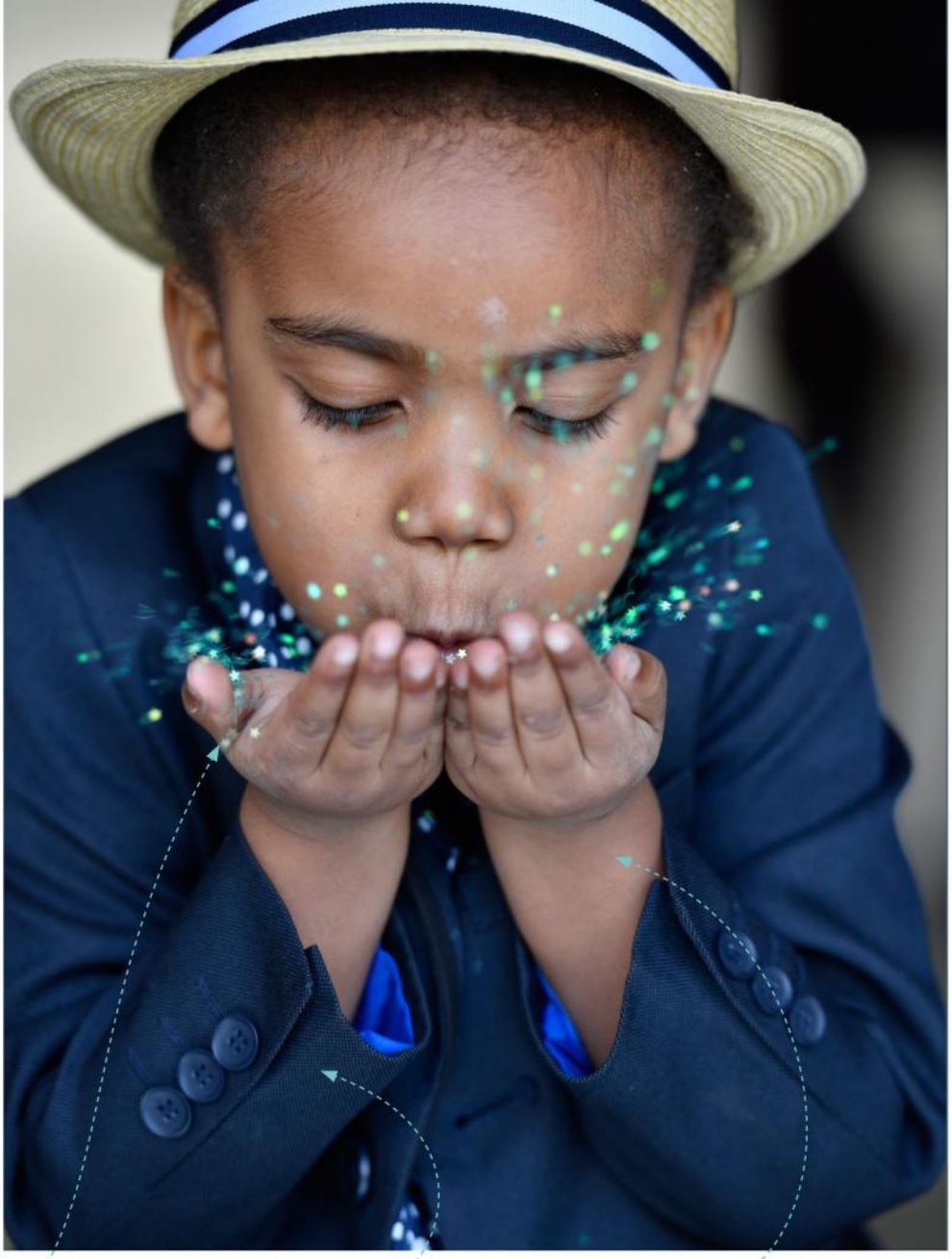
Performance

In many respects the D5 is a phenomenal performer. It beats or matches the 24MP D750 for detail resolution, for example. Real-world images look cleaner and sharper than those from the D4S, although it's best to keep sensitivity below ISO 102,400, and the results at the maximum sensitivity setting (ISO 3,280,000) are very poor.

I found the AF system extremely capable, getting fast-moving subjects sharp in very low light and tracking them around the frame. The 3D tracking option is useful, but it relies on a strong colour contrast between the subject and the background.

In other respects the D5 performs well. The Matrix metering system is fairly easily influenced by very dark or bright sections in the scene, but it's usually predictable.

Angela Nicholson



1

Decisive timing
The 12fps burst rate came in very handy for getting a nice cloud of glitter on an Aspire Photography Training course. (www.aspirephotographytraining.co.uk).

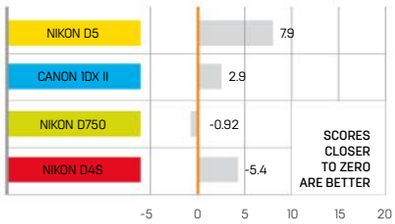
2

Faithful hues
At low sensitivity settings, the D5 captures a lot of detail, with results on a par with or even beating a higher-resolution camera like the D750, for example.

3

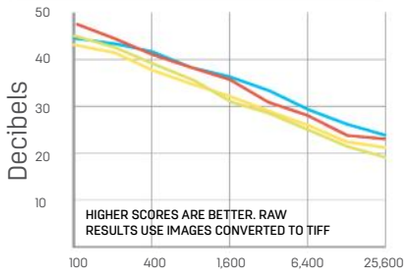
Natural colour
In the Standard Picture Control mode, the D5 produces quite subtle shades of natural subjects, but it still makes bold colours look pleasantly vibrant.

COLOUR ERROR



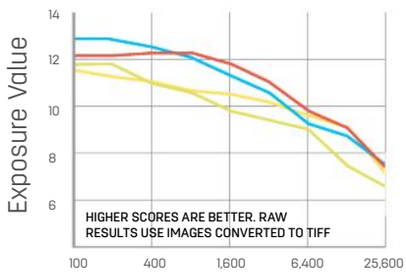
This indicates that the D5 produces more vibrant images than the competing cameras. We found it produced quite muted tones of natural subjects like landscapes or people.

RAW SIGNAL-TO-NOISE RATIO



DXO Analyzer was unable to analyse the files taken at the D5's upper sensitivity values. The Canon 1D X Mark II beats the D5 in all but the lowest sensitivity values.

RAW DYNAMIC RANGE



While the D5's raw file dynamic range is good, it is beaten by the D4S and the 1D X Mark II, indicating that these cameras capture a broader range of tones.

WE SAY...

The D5 is a great camera and a worthwhile upgrade to the D4S, but there are a few niggles that stop it from being an absolute belter. The top sensitivity expansion settings are headline-grabbing, if largely useless to most photographers, but the image quality in the native sensitivity range is high, provided you keep an eye on the exposure.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★½
VALUE	★★★½☆
OVERALL	★★★★½

Meet the rivals...

The cameras taking on the Nikon D5...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon EOS-1D X Mark II
£4,799/$5,999 (body only)
Canon's direct competitor, this 20.2MP full-frame SLR has superb AF, 14fps shooting and excellent metering.
Reviewed Page 52
★★★★★

Nikon D750
£1,514/$1,897 (body only)
Aimed at enthusiast photographers, the D750 is a capable all-rounder that has a 24MP full-frame sensor and an excellent AF system.
Reviewed Page 36
★★★★★

Nikon D4S
£4,189/$5,997 (body only)
Still a great 16MP camera, the D4S has been popular with pros. There should be some well-used examples available second-hand.
Reviewed Issue 153
★★★★★

HARD CASES

Ultimate gear protection for when the going gets really rough

www.calphoto.co.uk

1 Calumet WT3434 Watertight Hard Case

£199

CALUMET hard cases range from the dinky 31 x 27 x 14cm, 1.8kg WT411 up to the monster WT9263, which weighs in at 12.2kg – although thankfully that model has wheels. This WT3434 case is hardly petite at 65 x 51 x 24cm, but you don't get wheels to suspend its hefty 8.2kg mass.

Even its chunky rubber-coated handle isn't enough to lighten this load, although extra handles on each end mean both arms – or a friend – can help take the strain. Inside is space for serious gear, including an exotic super-tele lens, all nestled in diced foam.

Four rugged catches secure the lockable lid, ensuring the neoprene seal is clamped tightly to keep out water and dust. Top-notch material quality exudes robustness, helping the WT3434 take our overzealous abuse in its stride.

OVERALL ★★★½☆

www.lowepro.com

2 Lowepro Hardside 300 Photo

£165/$150

THE Hardside 300 Photo has an IP67 rating, certifying it dustproof and waterproof in a metre of water for up to 30 minutes. Lowepro uses an ABS polymer for the outer shell. While this easily survived our testing, it gives the impression of being slightly more brittle than some of the other case materials.

You won't find typical diced foam inside, but rather a removable, self-contained padded soft case with customisable dividers and even a pair of concealable backpack straps. Within this is space for a body and an attached lens, plus up to six extra lenses – although the case's relatively svelte form means the optimal divider layout is best suited to narrower APS-C optics.

The payoff is 45 x 30 x 18cm outer dimensions, which comply with most airline carry-on requirements.

OVERALL ★★★★☆

www.peli.com

3 Peli 1525 Air Case

£238/$169

HARD cases have many benefits, but lightness isn't usually one of them. Peli's Air range is a breath of fresh you-know-what: the 1525 Air weighs just 3.2kg with foam, making it noticeably lighter than Peli's slightly smaller 5.26kg iM2600 Storm Case. Space hasn't been sacrificed to achieve this, as internal dimensions of 52 x 29 x 17cm make the 1525 Air a good fit for a typical kit.

Robustness isn't compromised either: Peli's used a clever honeycomb construction and a new lightweight plastic polymer. When subjected to extreme abuse, the Air flexes slightly more than the conventional Storm Case, but it's still reassuringly tough.

Useful details, like steel protectors around the padlocking points and an ergonomic rubber-coated handle, seal the deal.

OVERALL ★★★★½

FIVE THINGS TO LOOK FOR...

1 ON A ROLL
Most hard cases weigh 4kg or more, even without gear. If you're travelling far, go for a rolling hard case.

2 HIGH ALTITUDE
To avoid any deformation, your airtight case should include a pressure equalisation valve.

3 CUSHIONING
The padding of choice for most hard cases is a simple block of foam, perforated into small cubes.

4 PLAN AHEAD
Diced foam can only be customised once. Lay out your kit beforehand to ensure optimal placement.

5 LITTLE EXTRAS
Padlock points are a must, while lid latches that release in two stages will stop accidental opening.

www.peli.com

4 Peli iM2620 Storm Case

£175/$179

COMPARED to the lightweight Air case, this 6.58kg design is on the weighty side, but it does sport wheels and an extendible handle so you can use it as a roller case. Toughness is a match for any case in this test group, with the handle and wheels not letting the side down either.

The iM2620 is relatively deep at 27cm, allowing a typical 24-70mm lens to slot in upright to save space, while the 54cm length and 41cm width make this case spacious without being unwieldy.

As with most of Peli's hard cases, you have a choice of internal padding. Pick 'n' Pluck diced foam is the cheapest option, but there's also a movable padded divider set. You can even spec an organiser pouch to store accessories like filters and batteries in the lid, while nifty press-and-pull lid latches come as standard.

OVERALL ★★★★★

www.vanguardworld.com

5 Vanguard Supreme 40F

£109/$180

THE Supreme 40F thrashes the Hardside 300's one-metre waterproof rating, as this case will keep your kit dry down to five metres underwater. Although, with so much foam inside, you have to wonder how the case could possibly sink so deep.

Its 43 x 30 x 18cm interior dimensions give enough space for a full-frame SLR and three or four lenses, while still retaining a convenient outer size and modest 4.4kg weight. Hexagonally diced foam is the included padding, although Vanguard sells an optional self-contained divider bag for added versatility.

Despite the keen price tag, there are nice extras like a comfy handle and non-slip rubber feet on the base. Robustness is top-notch too, with the Supreme being every bit as tough as the Calumet and Peli cases.

OVERALL ★★★★★

www.vanguardworld.com

6 Vanguard VGP-13

£79/$105

IT'S not just Peli that's tried to lighten hard cases. The VGP-13's internal dimensions may be slightly smaller than the 1525 Air at 45 x 31 x 15cm, but its foam-equipped weight of 3.2kg is impressive nonetheless.

However, where the Air saves weight without compromise, this case isn't quite so impenetrable. It's constructed of a reinforced aluminium frame surrounding plastic panels, but though these flexed more than a conventional hard case in our testing, the VGP-13 still survived perfectly intact. The packing-case look is also easier on the eye than more utilitarian designs.

Both diced foam and customisable divider interiors are included, and Vanguard even throws in a shoulder strap. The only things missing here are waterproofing, and sufficient space for a bulky full-frame set-up.

OVERALL ★★★★½

CSC www.olympus-global.com/en

Olympus Pen-F

£899/$999

The most advanced Pen-series camera has the features and handling to charm enthusiasts

SPECIFICATIONS

Sensor__ Four Thirds (17.4 x 13mm) LiveMOS sensor with 20.3 million effective pixels
Focal length conversion or lens__ 2x
Memory__ SD/SDHC/SDXC
Viewfinder__ Electronic viewfinder with 2,3600,000 dots
Max video resolution__ Full HD (1,920 x 1,080), 30fps
ISO range__ 200-25,600 (expandable to 80-25,600)
Autofocus points__ 81
Max Burst rate__ 5fps with AF (10fps with AF locked at start)
Screen__ 3-inch 1,037,000-dot TFT
Shutter speeds __ 1/8,000-60 sec plus Bulb
Weight __ 373g (body only)
Dimensions __ 125 x 72 x 37mm
Power supply__ Lithium-ion BLN-1 (supplied)

The Pen-F integrates an OLED electronic viewfinder with 2.36 million dots into its body

OLYMPUS has two lines of Micro Four Thirds compact system camera: Pen and OM-D, with the latter the more 'serious' of the pair. The Pen-F comes in at the top of the current Pen line-up and has a 20-million-pixel Four Thirds type sensor – that's four million more pixels than previous Pen models.

Until now, one of the key distinctions between the two lines has been that the OM-D cameras have a built-in viewfinder, while the Pen models don't. The Pen-F changes that, integrating an OLED electronic viewfinder with 2.36 million dots into its body. It also has Olympus's excellent five-axis image stabilisation built-in. This is claimed to extend the safe hand-holding shutter speed by up to 5EV – that's the difference between 1/500 sec and 1/15 sec.

Other highlights include a maximum continuous shooting speed of five frames per second with full AF and metering operation (or 10fps without); an 81-point contrast detection autofocus system; Full HD (1,920 x 1,080) at a range of frame rates; 28 Art Filter effects; Wi-Fi connectivity; and the High Res Shot mode first seen on the OM-D E-M5 Mark II.

This system makes use of the Pen-F's stabilisation system to shift the sensor between shots as it captures eight 20MP images. These files are then merged into a single high-resolution image. On the E-M5 II, High Res Shot mode delivers 40MP JPEG images or 64MP raw files; but on the Pen-F, the JPEG image size has been increased to 50MP, while the raw files are a whopping 80.6MP. However, the maximum shutter speed available is 8 sec, while the minimum aperture is f/8 and the highest available sensitivity setting is ISO 1,600.

1 This dial gives a route to the Art Filters and Color Creator as well as the Monochrome Profile Control and Colour Profile Control.

2 This 3-inch 1,037K-dot LCD is touch-sensitive and attached via an articulating bracket, so it can be flipped out and angled up or down.

3 There's a small, but effective thumbgrip on the back, which helps keep the camera steady in your hand.

4 There's an exposure compensation dial on an Olympus digital camera for the very first time.

Build & handling

The Pen-F has the type of build that makes you smile when you pick it up – solid and made from metal. But while the body and milled metal dials

Despite the low light, low contrast and netting, the autofocus system was able to get this moving subject sharp.

are of high quality, the buttons on the back of the camera are the small plastic affairs that drew some criticism in the Olympus Pen and OM-D ranges.

The 2.36-million-dot electronic viewfinder is very good, with a high refresh rate so you can pan with moving subjects, and it shows lots of detail in good light. When the EVF Auto Luminance option was turned on in the menu, however, I found that the viewfinder sometimes showed the scene brighter than the recorded image, which tricked me into underexposing. I recommend setting the EVF brightness manually.

The 3-inch, 1,037k-dot LCD on the back of the camera is also very good, responding quickly to a touch and displaying lots of detail. It's a shame that it's not possible to make main menu selections and adjustments using touch control, but it is possible with the Super Control Panel.

On the whole, the Pen-F is pleasant to use, but it has some of the quirks that we've seen with other Olympus cameras. For example, it's sometimes necessary to turn the camera off and on again to get the electronic level to activate when the appropriate button is pressed.

Performance

The Pen-F's sensor has 20.3 million effective pixels, which is roughly 25% more than on any other current Olympus Pen or OM-D cameras. Our lab tests reveal that, in comparison with the Pen E-P5, this brings a significant hike in the amount of detail in images at lower sensitivity

1 **Good colour**
Don't like the colour you're getting from the Pen-F? Try changing the Picture Control mode or the Colour Profile.

2 **Touch focus**
The vari-angle screen is helpful when you're shooting from an awkward angle, and the AF point can be set with a tap.

3 **Go large!**
The Pen-F's High Res Shot mode allows you to make great prints at huge sizes – even over A1 (594 x 841mm).

Meet the rivals

The cameras taking on the Pen-F...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Fujifilm X-E2S
£549/$699 (body)
Built with rangefinder-like styling, this 16.3MP CSC uses Fujifilm's impressive APS-C format X-Trans CMOS II sensor, and has a superb electronic viewfinder.
Reviewed Page 58

Olympus OM-D E-M10 II
£449/$649 (body)
This dinky 16MP Micro Four Thirds CSC has an excellent electronic viewfinder, lots of customisation options, and a tilting touchscreen.
Reviewed Page 18

Panasonic GX8
£575/$1,198 (body)
It's bigger than many CSCs, but this 20MP model has a tilting electronic viewfinder and a fully articulating screen, along with Panasonic's 4K Photo feature.
Reviewed Issue 170

The Dramatic Tone II Art Filter can produce some attractive high-contrast images.

settings. However, above ISO 3,200 the level of detail in Pen-F images is a little lower than in the E-P5's shots. Also, JPEGs viewed at 100% lack the 'bite' or sharpness of files from some other cameras, but they look good when sized to make prints.

Noise is controlled well for most of the Pen-F's sensitivity range. As usual, in the default noise-reduction setting you can expect to see some fine details lost from JPEGs at the upper sensitivity settings. Nevertheless ISO 6,400 images (both raw and JPEG) look good at A3 size.

Switching to the High-Res Shot mode slows shooting down considerably, with each image taking nine seconds or more to clear the buffer – but the results are impressive. Detail levels are increased markedly, enabling much bigger prints (larger than A1) to be made. The downside is that it's a 'tripod-only' option, and is unsuitable for shooting subjects with moving elements such as flowing water.

There seems to be an near-infinite number of ways to tweak the colour of JPEGs to suit your preferences, so if you don't like the results from the Pen-F, you probably just need to find the right setting. The Natural Picture Mode makes a good starting point and produces natural, if slightly muted, colours and contrast. If you want a bit more punch, switch to the Vivid or I-Enhance mode.

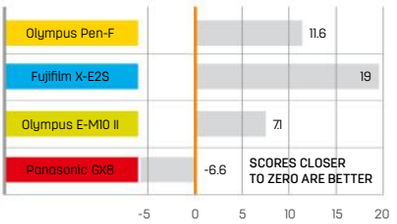
Although the Pen-F has a contrast-detection system, rather than a hybrid solution that combines contrast detection with a phase system, it's fast and accurate in many situations. It works well in quite low light, but you can expect a bit of hunting as contrast levels drop further. Provided that you keep the active AF point over the subject, it's also pretty good at keeping moving subjects sharp in continuous AF mode, but the Tracking AF mode is more hit-and-miss.

Olympus's stabilisation system is well regarded, and it doesn't disappoint in the Pen-F. When shooting with the popular 12-50mm f/3.5-6.3 EZ ED MSC lens at 50mm (100mm equivalent), for example, I found I was able to get a high hit rate at 1/6 sec, producing close-range images that look acceptable at 100%. That's a compensation factor of around 4EV.

Angela Nicholson

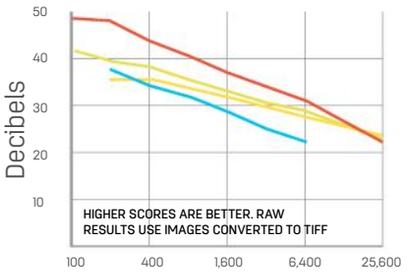
There are dials a-plenty on the Pen-F's top plate.

COLOUR ERROR



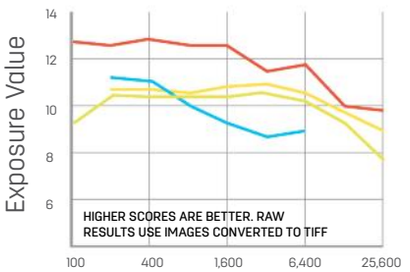
The Pen-F tends to produce quite saturated colours in its Natural Picture mode, although the Fujifilm X-E2S JPEGs are more vibrant.

RAW SIGNAL-TO-NOISE RATIO



Although the Pen-F scores well, it can't match the heights of the Panasonic GX8. In High Res Shot mode, the results are better than in the standard mode.

RAW DYNAMIC RANGE



The Pen-F's raw files are quite similar to the JPEGs and don't match the high scores of the competing cameras. However, they have good scope for post-capture adjustment.

WE SAY...

The Pen-F is an excellent camera with bags of features, plus lots of scope for customisation of both the controls and the appearance of the images it produces. It may take you a while to work through the various options and optimise it for the way you want to shoot, but it's worth taking the time to explore and experiment.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★☆
VALUE	★★★½☆
OVERALL	★★★★☆

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Olympus OM-D E-M5 Mark II

£749/$899 (body only)

Olympus' 16MP E-M5 Mark II can produce 40MP or even 64MP images automatically. ***Angela Nicholson*** *finds out how*

SPECIFICATIONS

Sensor _ 16.1MP Micro Four Thirds format (17.3 x 13mm)
Focal Length _ 2.0x
Memory _ SD/SDHC/SDXC
Viewfinder _ Electronic viewfinder (EVF) with 2,360,000 dots (approx 100% cover)
Video resolution _ 1080
ISO range _ 100–25,600
Autofocus points _ 81
Max burst rate _ 10fps (AF, white balance and exposure locked at start)
Screen _ Vari-angle three-inch, 1,037,000-dot touchscreen
Shutter speeds _ Mechanical shutter, 1/8,000-60 sec plus Bulb; electronic shutter, 1/1,6000-60 sec
Weight _ 417g (body only)
Dimensions _ 124 x 85 x 38mm
Power supply _ BLN-1 rechargeable lithium ion battery (supplied)

"It may be small, but the OM-D E-M5 Mark II feels nicely constructed. Its magnesium body is solid and comfortable"

THE Olympus OM-D E-M5 was the first camera in Olympus's OM-D line of Micro Four Thirds compact system cameras, and is sometimes referred to as the original OM-D. Its electronic viewfinder and SLR-like design distinguished it from the Olympus Pen series. It was also aimed at more experienced photographers than the Pen or Pen Lite.

As the name suggests, the OM-D E-M5 Mark II is the replacement for the original E-M5. It sits between the top-end E-M1 and the lower-level E-M10 in the OM-D range.

Features

The E-M5 II uses a modified version of the 16.1MP Four Thirds type (17.3 x 13mm) sensor in the original E-M5, but it's coupled with the TruePic VII processing engine of the E-M1. A more significant upgrade, however, is the Mark II's ability to create 40MP JPEG or 64MP raw files automatically in its High Res Shot mode. Using the upgraded Image Stabilizer, it shifts the sensor by a tiny amount between shots as it takes a sequence of eight images. The camera then combines these images into a large composite. As the capture process takes around a second, High Res Shot mode is a tripod-only feature that's designed for motionless subjects.

The fingergrip is slim but effective.

Olympus has also improved the sensor-shifting five-axis image stabilisation system for the E-M5 Mark II. It claims a 5EV extension in the safe hand-holdable shutter speed; that's the difference between 1/500 sec and 1/15 sec. Significantly, it also works in video mode.

Live Bulb and Live Time mode are both present, along with the Live Composite mode introduced with the E-M10. These allow you to see long-exposure images building up on the camera's screen, or on a smartphone or tablet connected via the camera's Wi-Fi system. Live Composite mode is intended for shooting fireworks and star trails or painting with light.

With the possible exception of the lack of a pop-up flash, the E-M5 Mark II has a comprehensive specification that provides the enthusiast photographer with just about everything they could want. It also has plenty to entice aspiring videographers, such as frame rates up to 60fps, bit rates up to 77Mbps, Time Code and a 3.5mm mic port.

Zooming in on the... OM-D E-M5 Mark II

This custom function button is a little too easy to press accidentally when you're holding the camera to your eye.

The mode dial has a lock to prevent you from changing modes by accident.

The Mark II has a couple of extra buttons on the top-plate and a rejig to the adjustment dial arrangement.

In a change from the original E-M5 layout, the power switch is now alongside the mode dial.

The new vari-angle 3-inch 1,037k-dot touch-sensitive screen is useful for composing images at awkward angles in landscape or portrait

The electronic viewfinder (EVF), which shows 100% of the scene, has been improved and has 2,360,000 dots rather than the 1,440,000 dots of the original E-M5's.

Build and handling

It may be small, but the OM-D E-M5 Mark II feels nicely constructed. Its magnesium body is solid, comfortable and secure in the hand. It's also dust- and water-proof, as well as freeze-proof down to -10 degrees C.

The E-M5 II sits between the E-M1 and E-M10 in the OM-D range, and its control arrangement is halfway between the two. Taking a cue from the E-M1, there's a switch on the back that changes the options adjusted by the two top-plate dials. This switch is a mixed blessing. On one hand, it doubles the number of options that can be adjusted via the dials, but on the other, you need to remember which setting gives access to the controls you want. You get into the swing of it once you've been using the camera for a while, but you can expect some frustration in the early days.

One of the great features of the OM-D series is that the cameras are extremely customisable. However, it can take quite a while to find and understand all the options as well as the huge range of features. The controls are all within easy reach, but some people may find the small buttons fiddly. I also found that a couple of buttons didn't behave as I would expect on a few occasions. The Info button, for example, which I used to toggle between the on-screen displays, occasionally wouldn't bring up the electronic level display. And there was a short period when I couldn't review images in the viewfinder. I was unable to find any explanation for this within the menu, and the ability to review recovered without me changing any settings.

Meet the rivals...

The cameras taking on the E-M5 Mk II

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

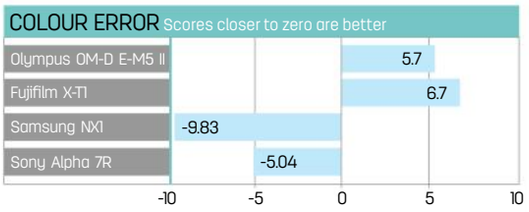
Fujifilm X-T1
Body: £795 / $1299
Traditional controls, weatherproof build and retro styling, plus superb-quality images make this SLR-like 16MP compact system camera a real winner.
Reviewed Issue 151
★★★★★

Samsung NX1
Body: £1,249 / $1,499
One of the E-M5 II's chief rivals has already fallen by the wayside, but this 28MP 4K video powerhouse could be a great used buy if you get lenses too.
Reviewed Issue 160
★★★★★

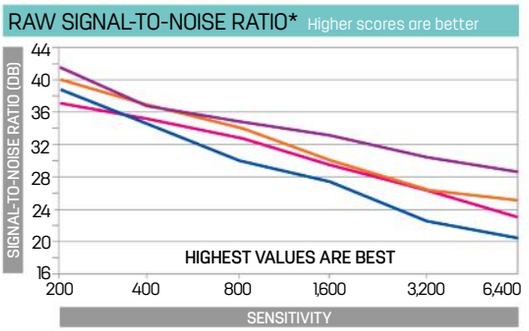
Sony Alpha 7R
Body: £999 / $1,898
Sony's first-generation A7R lacks the in-body image stabilisation of its successor but its 36MP full-frame sensor delivers both power and value.
Reviewed Issue 147
★★★★½

CSC BENCHMARKS

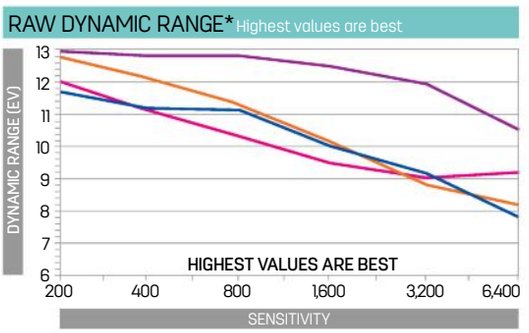
How does the Olympus E-M5 Mark II fare?



COLOUR ERROR RESULT: Some hues are a little over-saturated, but on the whole, the E-M5 Mark II produces very pleasing colours.



NOISE RESULT: In its standard 16MP mode, the E-M5 II beats its rivals at most ISO settings, indicating that images are a little cleaner.



DYNAMIC RESULT: The E-M5 II performs consistently throughout its sensitivity range. This indicates that raw files have a wide tonal range.

OVERALL BENCHMARK RESULT

Overall the OM-D E-M5 II puts in a good performance in our lab. While it can't match the Samsung and Sony cameras and their larger, higher-pixel-count sensors for detail resolution in its standard 16MP mode, it produces very respectable results for a Micro Four Thirds camera – and can match them in High Res Shot mode.

* Raw results use images converted to TIFF

Below This is the first Olympus CSC to have a vari-angle screen.

Above It was very useful to be able to check the focus was spot-on using the magnified view in the rear display.

The electronic viewfinder provides a good view of the subject. There's no sign of any texture or flickering, and the contrast is a good match for the scene's. With the Natural Picture mode selected, the viewfinder image sometimes looks a little more saturated than the scene, but the hues are a good match. There's some noise visible in very low light, but you can still see the subject clearly.

Performance

One of the main attractions of the OM-D E-M5 Mark II is its High Res Mode, which enables it to record 40MP JPEG images or 64MP raw files. As you might imagine, this isn't without compromise. Sensitivity is limited to ISO 100-1,600, the minimum aperture is f/8 and the slowest available shutter speed is eight seconds.

It's also essential that the camera is stationary and that the subject doesn't move. Even small movements result in a hatched pattern appearing or ghosting in images. The High Res Shot raw files also have to be processed using a free Photoshop plug-in for Windows or Mac OS X.

Olympus prefers to refer to the camera as a 40MP model, because the engineers believe that the 64MP raw files only resolve a level of detail equivalent to that from a 40MP camera. Of course it depends upon what format that camera is: let's not forget that the Four Thirds-type sensor inside the OM-D series cameras is smaller than both APS-C and full-frame format. However, our tests show that at the lowest sensitivity settings the E-M5 Mark II can match the full-frame 36MP Nikon D810 for resolving power. It drops away from the D810 a little as sensitivity rises, but as the camera has to be tripod-mounted and the subject motionless, there will be few occasions when sensitivity needs to be raised above ISO 200.

The results are very impressive. Comparing simultaneously captured high-resolution files at 100% reveals that the JPEGs look slightly sharper and more natural, which seems to bear out Olympus's decision to limit their size at 40MP.

Turning to the standard (16MP) files, noise is controlled well from ISO 100-6,400, although some luminance noise is visible at 100% in images taken at the lowest sensitivities. Unusually, JPEG files taken in the standard settings

look very similar to raw files processed in the supplied Olympus Viewer software with all noise reduction turned off. Even at the highest sensitivity setting, there's little chroma noise (coloured speckling) visible, but luminance noise is present at every value.

The results at ISO 6,400 are good, but stepping up to ISO 12,800 and ISO 25,600 increases the level of smudging in images viewed at 100% and colour saturation drops. These images also look a little softer than ISO 200 shots when sized to make A3 prints, but are still passable.

Above Despite being hand-held and taken at 1/6 sec to blur the man's movement, the surrounding walls are perfectly sharp.

Left Seals around the controls keep out moisture and dust effectively.

The E-M5 II's automatic white balance system does a very good job in most natural lighting situations. It also doesn't fare badly in some artificial lighting situations, adding a hint of colour that gives away the light source. Colours are also handled well in the Natural Picture mode, but there's a collection of other options, such as Vivid, Muted, Portrait and Monotone, as well as the Custom, Color Creator and Art Filter options, if you're looking for a different treatment to be applied to the JPEG files. Helpfully raw files can be recorded at the same time so you can have a 'clean' image for post-capture processing if you want.

Although it doesn't have the hybrid AF system of the Olympus OM-D E-M1, the E-M5 Mark II's 81-point AF system is very good. In normal daylight conditions, it gets subjects sharp quickly; and while it struggled more than the Canon 5D Mark III, I was able to get some sharp images in poor light using the M Zuiko Digital ED 40–150mm f/2.8 Pro lens. When shooting with the M Zuiko Digital 12-50mm f/3.5–6.3 EZ ED MSC kit lens at 14–17mm, which equates to 28–34mm in full-frame terms, I got consistently sharp results that stand scrutiny at 100% at 1/6 sec. Most shots I took at 1/5 sec are also sharp at 100%, which is very impressive.

Verdict

Although the occasions in which the system can be used are limited, the E-M5 Mark II's ability to shoot 40MP and 64MP files is very attractive. This and the vari-angle screen could attract new users to the OM-D series, as well as entice existing E-M5 users.

The E-M5 Mark II has a large feature set, and it can take a while to discover important controls and get familiar with the layout. While experience helps, the interface would benefit from a rethink to group more of the connected features or controls together. It is an excellent camera, but these limitations stop the E-M5 Mark II from getting a perfect score.

WE SAY...

This is a capable camera that offers extensive control. However, its complexity should not be underestimated. The new High Res Shot mode is especially impressive, despite its limitations.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
IMAGE QUALITY	★★★★★
VALUE	★★★★★
OVERALL	★★★★½

CSC www.olympus.com

Olympus OM-D E-M1 II

£1,850/$1,999 (body only)

With a 60fps full-resolution burst mode plus a new autofocus system and sensor, this CSC looks amazing

SPECIFICATIONS

Sensor _ 20.4MP Micro Four Thirds Live MOS sensor (17.3 x 13mm)
Focal length conversion on lens _ 2x
Memory _ 2x SD/SDHC/SDXC (1x UHS-1, 1x UHS-II)
Viewfinder _ EVF, 2,360k dots
Max video resolution _ 4K (4,096 x 2,160)
ISO range _ 'Low'-25,600
Autofocus _ Hybrid phase/contrast detection, 121 points, all cross-type
Max burst rate _ 60fps AF locked, 18fps with AF
Screen _ 3-inch vari-angle, 1,037k dots
Shutter speeds _ 60-1/8000 sec, Bulb
Weight _ 574g, body only, with battery and memory card
Dimensions _ 134 x 91 x 69mm
Power supply _ BLH-1 lithium-Ion battery (supplied), 440 shots

The E-M1 II's 60fps burst mode is a spectacular leap forward in high-speed shooting

OLYMPUS has played two aces with the E-M1 II. Its 60fps burst mode is a spectacular leap forward in high-speed shooting, and even though you have to step down to 18fps to get focus tracking with moving subjects, that's still a poke in the eye for heavier, more expensive – and slower – pro SLRs like the Canon EOS-1D X II and the Nikon D5.

This camera's other party trick is its new all-phase-detection autofocus system – designed to prove that mirrorless cameras can match SLRs for tracking moving subjects. The AF system uses 121 on-sensor phase detection AF points arranged in a rectangular array that covers a much larger area of the frame (80% of the frame width, 75% of the frame height) than regular digital SLR systems.

But let's get back to that continuous shooting capability. The bald fact is the E-M1 II can shoot full-resolution, uncropped 20-megapixel images at 60 frames per second, and it can keep this up for 48 frames (raw or JPEG) – long enough to be much more likely of capturing a key frame than a regular SLR. And if you're not sure your reactions will be quick enough, there's a Pro Capture mode that starts buffering frames as soon as you half-press the shutter release so that when you press it the rest of the way, you don't just capture frames from that point on, but the preceding 14 frames too.

All this happens using the OM-D M1 Mark II's silent shutter mode. It has to lock focus and exposure at the first frame, but it's designed to be used where the point at which the action will occur can be framed up in advance.

The new camera is splash-proof, dust-proof and cold-proof down to 10 degrees Centigrade. It comes with a quoted shutter life of 200,000 shots and an optional new HLD-9 battery grip that doubles the battery life (always a sore point with mirrorless cameras) and has dedicated controls for vertical shooting.

1 The E-M1 II's smaller sensor format pays dividends with smaller, lighter lenses.

2 The electronic viewfinder has a high resolution (2.36MP) and a higher frame rate for less lag.

3 The fully-articulating LCD display is a step forward from the simple tilt mechanism in the original E-M1.

4 You'd hope that the E-M1 II would have a dedicated drive mode dial – instead, you have to press this button and turn the rear dial.

1
Colour rendition
Olympus cameras are known for their nice-looking JPEG images. The Vivid style used here has added vibrancy to a dull, overcast afternoon.

2
Autofocus
The autofocus response is exceptional: the OM-D E-M1 II's high-tech phase-detection system focused on this bird of prey in an instant.

3
Depth of field
The smaller sensor format gives greater depth of field, although it's still easy to throw backgrounds out of focus with a fast prime lens.

Inside the body is a 20.4-megapixel Live MOS sensor measuring 17.3 x 13mm, with an ISO range of 'Low' to 25,600. It's equipped with a newly redesigned five-axis image stabilisation system, which can work in conjunction with a new 12-140m f/4 IS lens, launched at the same time as the camera.

The E-M1 II can shoot 4K video in both the C4K (4,096 x 2,160) and 4K/UHD (3,840 x 2,160) formats – and this new lens is designed not only to offer a useful focal range for videographers (24-200mm equivalent) but to offer even better hand-held footage thanks to its own in-built image stabiliser. Olympus is claiming a 6.5-stop shutter speed advantage for this camera and lens.

Build and handling

The E-M1 Mark II is the largest camera in Olympus's OM-D range, but it's positively diminutive next to a pro SLR. The smaller sensor size of the Olympus means it's at a disadvantage for ultimate image quality, but it brings two big advantages: size and weight. It's not just about the size of the body, but the lenses too. The 12-40mm f/2.8 Pro lens (24-80mm effective) is half the size and weight of a full-frame equivalent; this goes right across the board, right up to Olympus's 40-150mm f/2.8 (80-300mm equivalent) and 300mm f/4 super-telephoto (600mm equivalent).

Despite the E-M1 II's relatively small size, Olympus has managed to squeeze on a lot of external controls without making them feel cramped. The key dials are on the right side of the top plate, and consist of a regular mode dial and two unmarked control dials whose function depends on both the mode you're in and the position of a lever on the back of the camera, just to the right of the viewfinder eyepiece. This effectively doubles up on the >

Meet the rivals...

The cameras taking on the Olympus OM-D E-M1 Mark II...

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Fujifilm X-T2
£1,399/$1,599
The X-T2 can't quite match the E-M1 II for high-speed bursts, but its 24MP APS-C X-Trans sensor's image quality and its AF system are first-rate.
Reviewed Issue 185
★★★★★

Panasonic GH4
£899/$1,198
It's due for replacement, but the GH4's specs still look special, with 4K video, continuous 12fps shooting and an innovative 30fps 4K Photo mode.
Reviewed Issue 154
★★★★★

Sony Alpha 6300
£899/$998
With continuous shooting up to 11fps and a super-high-tech AF system, the A6300 is more powerful than its understated looks suggest. Look out for the A6500 soon.
★★★★½

With a continuous shooting rate of 60fps, the E-M1 II can reliably capture moments that would require sheer luck with any other camera.

control dial functions – as long as you remember to set the lever to the correct position.

This is a camera that you can easily get confused with, at least initially. Despite the array of external controls, it also relies heavily on its menu system and an interactive touch-screen control layout, activated by the OK button in the middle of the four-way controller.

You don't have to use the touch system – you can also navigate through the options using the four-way controller buttons and the control dials on the top of the camera.

But what about the revolutionary continuous shooting and autofocus modes? These are key features that surely deserved a rethink of the camera's external layout, with dedicated controls for each. Instead, the E-M1 II follows the same generic exterior layout as its predecessor, giving no real external clue to its enhanced capabilities.

The actual shooting experience is hard to fault, though. The electronic viewfinder is crisp and clear with little lag, even in low light, and the shutter action is unusually soft – much softer than its predecessor's. The feel of the materials and controls is first-rate – this feels such a finely made, high-precision device that you have to remind yourself it's also been 'ruggedised' for outdoor conditions.

Performance

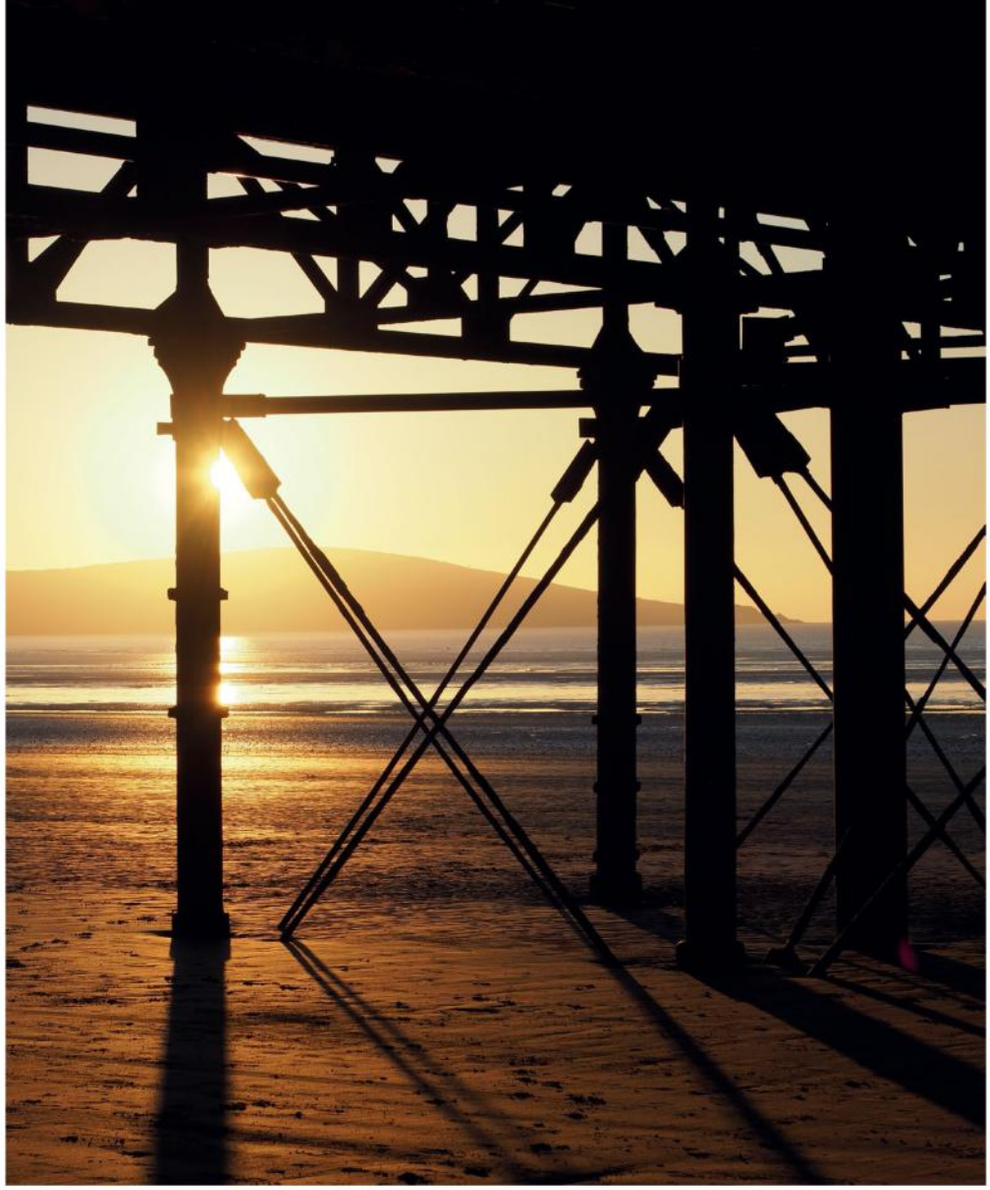
The OM-D E-M1 II's sensor is half the size of APS-C and around one-quarter the size of a full-frame SLR sensor, yet you wouldn't know it from the images it produces. They are extremely sharp; the roll-off in bright highlights is smooth and subtle; and lens aberrations like distortion and fringing are processed out so well that they effectively cease to exist.

The OM-D II performs well at higher ISOs too, although larger-sensor rivals pull ahead here.

The high-tech autofocus system is harder to judge. We got a mixture of duds and successful shots in our early tests. What's obvious straight away is its static AF speed. It feels at least as fast in single-shot AF mode as any pro SLR. It hunts from time to time in low light, however, or with low-contrast subjects, but the speed at which it can refocus from infinity to a subject close to the camera and back again borders on the uncanny.

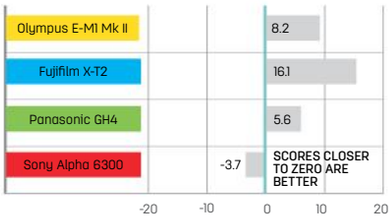
The E-M1 II is a fraction of the weight and cost of a high-speed pro sports SLR, but it has an autofocus system which narrows or perhaps even eliminates the performance gap between mirrorless and SLR technologies – and can shoot at speeds that no SLR can match.

Rod Lawton



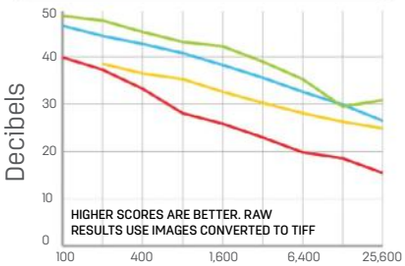
The quality at higher ISOs falls behind APS-C and full-frame cameras – but not by much. The five-axis stabilisation makes this a good low-light camera.

COLOUR ERROR



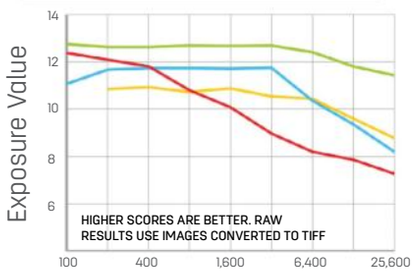
It's not the worst, it's not the best. The OM-D E-M1 II's colour rendition is more accurate than the X-T2's, but the Sony A6300 and Panasonic GH4 are more neutral.

RAW SIGNAL-TO-NOISE RATIO



The Olympus doesn't achieve the same performance as the X-T2 or, surprisingly, the rather good GH4. It did better than the Sony A6300 at higher ISOs, though.

RAW DYNAMIC RANGE



The Panasonic GH4 and Sony A6300 are the winners here, but the Olympus is not so far behind and maintains its dynamic range right through to higher ISO settings.

WE SAY...

We'd want to do more extensive tests before reaching any final decision about the E-M1's continuous focus tracking performance, but it's an extraordinary camera in every other respect. The image quality belies its small sensor, and its static autofocus and burst shooting modes are exceptional.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★★★
OVERALL	★★★★★

RAIN COVERS

Don't let rain stop play: keep your camera dry and ready to capture wet-weather wonders

www.mindshiftgear.com

1 MindShift Gear UltraLight 20

£27/$35

THIS is actually a type of small, light bag that keeps your camera dry between shots, but you need to take out the camera for use. It's essentially a lightly padded fabric cube where the top flap folds over your camera and fastens around the lens with a drawstring. This mid-sized version will wrap around a full-frame SLR with a modest zoom lens, and features an integrated waist belt that allows the cover to be worn like a holster bag.

Unlike a traditional holster design, this cover can be collapsed and scrunched into its own compact pouch for ultimate portability. This means it's just the ticket for stashing in your main camera bag, ready for a day when you want to travel light but still want to pack some protection should the heavens open.

OVERALL ★★☆☆☆

www.thinktankphoto.com

2 Think Tank Hydrophobia 70-200

£128/$150

THE Hydrophobia may not be cheap, but you're paying for a real step up in design. Rather than two hand openings either side of the camera body, here the left opening is further forward, just where you need it for lens controls. There's also a grippy coating inside the lens jacket that ensures it won't slide out of place. More useful extras include a rugged carry strap and a front lens cover cap, should you need extra wet-weather protection between shoots.

A clever touch is the viewfinder hole in the back panel – although to achieve a waterproof seal, you'll have to spend £27/$35 on a compatible camera eyepiece. The material surrounding this can also obscure the top of a smaller camera's rear LCD. But overall, this no-compromise cover is a pleasure to use, even in extreme conditions.

OVERALL ★★★★★

www.manfrotto.co.uk

3 Peak Design Shell

£30/$40

THE second of the two basic cover designs here, Shell is designed to work in harmony with Peak Design's Capture Clip system, which attaches your camera to a belt or a bag strap. What's more, where the MindShift cover is designed as a stowaway pouch, you can still use your camera with Shell fitted.

The stretchy neoprene sleeve slips over your lens and onto the camera body, with drawstring cords tightening around the base and lens to create a snug fit. A couple of well-sealed slots allow your camera's strap to pass through the top.

Although Shell looks neat and tidy when fitted, the cover needs to be folded back awkwardly to use your camera; even then, the lens is still obscured, making this better suited to protecting a prime optic. A clever concept, but not without its limitations.

OVERALL ★★★☆☆

WHAT TO LOOK FOR IN A RAIN COVER

There's more to a rain cover than simply shielding your camera from dust or a drenching. Most covers are designed for use with pro SLRs and large lenses like a 70-200mm zoom. Some cover designs are longer or extendable for super-telephoto optics. Smaller kits are likely to be swallowed by excess material, making them tricky to operate. A cover with a clear plastic panel will let you see your camera, and some also have a small hole that'll keep your viewfinder visible should the plastic fog up.

4

www.manfrotto.co.uk

Manfrotto Pro Light E-702 PL

£54/$60

THIS cover is spacious enough to protect a full-frame SLR and a 70-200mm lens, with enough room to allow easy operation of all the camera and lens controls. But unlike some covers, where you'll have to fumble around blind, Manfrotto's large clear plastic panel lets you see everything, although condensation build-up in cold or humid weather could spoil the view.

Rain will have a job getting inside, thanks to drawstrings securing both arm holes and the lens opening. The latter has a semi-rigid adjustable collar to ensure free movement of an extending lens barrel.

Attaching the cover is quick and easy, with a large Velcro-fastened slot in the base that also allows a tripod mount to pass through.

OVERALL ★★★★½

5

http://e.matin.co.kr

Matin M-7098 Deluxe

£40

LIKE the Manfrotto cover, this design features a transparent section. It's only large enough to view your camera's rear and top panels, though, so you'd better be well acquainted with your controls. On the plus side, the clear portion incorporates a small hole that lets a viewfinder eyepiece pass though, so you won't miss a shot should the plastic fog up.

This is a versatile cover. In its standard configuration, it'll shelter a good-sized pro body and a 24-70mm optic, but an additional cover stowed in a small attached pouch can be unravelled to add an extra 33cm of lens protection. However, it's hardly an elegant system, and the joint between the two sections of cover isn't watertight. The thin, cheap-feeling material doesn't inspire confidence, either. You get a lot for your money, but don't expect top quality.

OVERALL ★★★★½

CSC www.ricoh-imaging.co.uk

Pentax K-70

£799/$897 with 18-135mm lens

Pentax elbows its way into the enthusiast digital SLR market with a tough new outdoor camera

SPECIFICATIONS

Sensor _ APS-C CMOS sensor, 23.5 x 15.6mm, 24.2MP
Lenses _ Pentax KAF2
Memory _ SD/SDHC/SDXC, UHS-I
Viewfinder _ **Optical pe**ntaprism, 0.95x, 100%
Max video resolution _ 1,920 x 1,080
ISO range _ 100-102,400
Autofocus points _ 11 (9 cross-type)
Max burst rate _ 6fps
Screen _ 3-inch vari-angle, 921,000 dots
Shutter speeds _ 1/6,000 sec to 30 sec, Bulb
Weight _ 688g
Dimensions _ 126 x 93 x 74mm (body only)
Power supply _ D-LI109 lithium-ion battery, 410 shots

The kit lens has a long focal range, is weather-resistant and has a non-rotating front element – perfect for use with filters

PENTAX is pitching the dustproof, weather-resistant and cold-resistant K-70 at the outdoor photography market. However, the K-70's specs suggest it's an all-rounder suited to a much wider range of subjects.

Its 24-megapixel APS-C sensor has no anti-aliasing filter, but an AA Filter Simulator that applies microscopic vibrations to imitate the effect of a physical filter. This is made possible by Pentax's five-axis Sensor Shift system. This can cut camera shake and is used for a Pixel Shift Resolution mode for better colour and definition in ultra-fine detail.

Pentax has also added hybrid contrast and phase detection autofocus in Live View mode.

Build & handling

The K-70's square body and square-shaped grip are purely functional: it's compact, easy to grip and the controls are all in the right places, but it's not really a thing of beauty. The twin control dials make it handy for experts who want to make adjustments quickly and the mode dial's Sv (Sensitivity Priority) and TAv (Shutter and Aperture Priority) effectively bring the ISO setting into the 'exposure triangle' on the main mode dial.

The kit lens has a long focal range, is weather-resistant and has a non-rotating front element, so it's perfect for use with filters. It's also relatively fast, smooth and quiet.

1 The K-70 is dustproof, weatherproof and cold-proof down to -10 degrees Centigrade.

2 The Sensor Shift system is used for image stabilisation, anti-aliasing filter simulation and a high-res mode.

3 The rear screen is fully articulating. The K-70 gets hybrid autofocus in Live View mode – a first for a Pentax SLR.

4 The main mode dial has Sv and TAv modes, which bring the ISO setting into the 'exposure triangle'.

Performance

Our lab results show that the K-70 is clearly capable of good results, but the 18-135mm kit lens has poor edge definition throughout the zoom and aperture range. K-70 buyers might be better off purchasing it in body-only form and then investing in more expensive glassware.

The default multi-pattern exposure metering does a reliable job and the auto white balance system strikes a good balance between correcting colour casts and preserving the atmosphere.

Rod Lawton

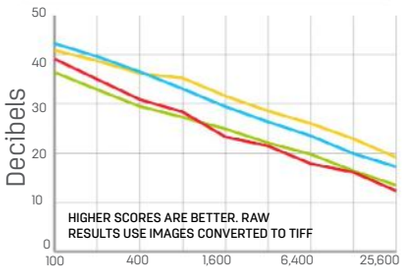
The vari-angle screen meant that we were able to get right down to puddle-level to capture this beautiful reflection – and the camera's decent level of weather-proofing proved to be rather reassuring in a downpour!

The extra zoom range of the 18-135mm kit lens is useful for isolating subjects and getting tighter compositions. Sharpness at full zoom was disappointing, however, and the 18-135mm lens had poor edge sharpness too.

COLOUR ERROR

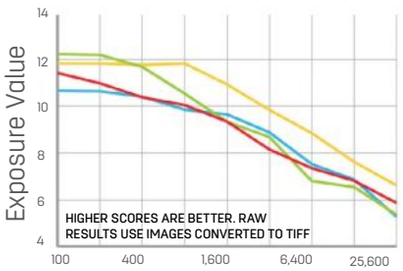
The K-70's strong but natural colour rendition gives it a pretty good score compared to rival cameras in this group.

RAW SIGNAL-TO-NOISE RATIO



The K-70 isn't the best for JPEG noise reduction, but the results from its raw files start to edge ahead at higher ISOs.

RAW DYNAMIC RANGE



The same story is repeated here. The K-70 offers similar dynamic range to the rest at low ISOs, but is better at high ISO settings.

WE SAY...

The K-70 is a compact, solid and well-specified camera for enthusiasts. It's packed with innovative features, and the articulated screen comes to life with the new hybrid Live View autofocus system. The 18-135mm kit lens, however, is a disappointment: it handles well, it focuses quickly and it offers a long zoom range, but the optical quality is poor.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★½☆
VALUE	★★★★½
OVERALL	★★★½☆

Meet the rivals...

The cameras taking on the Pentax K-70...

FOR MORE IN-DEPTH CAMERA REVIEWS, VISIT www.techradar.com/cameras

Canon EOS 760D
£509/$849 (body)
With its 24MP sensor, vari-angle display and hybrid CMOS AF sensor, the 760D is a close match for the K-70 in all aspects but ruggedness.
Reviewed Issue 166
★★★★★

Nikon D7200
£999/$1,297 (body with 18-105mm lens)
The D7200 delivers excellent resolution and image quality with good handling. Bought with Nikon's very good 18-105mm kit lens, it's pricey.
Reviewed Issue 164
★★★★★

Sony Alpha 68
£629/$698 (body with 18-55mm lens)
The translucent mirror combines the autofocus speed of an SLR with the Live View of a mirrorless camera. Its AF system is very powerful.
Reviewed Issue 180
★★★★½

CSC www.sigma-imaging-uk.com

Sigma sd Quattro

£699/$799

Sigma takes its three-layer sensor technology to the next level in a new mirrorless camera

SPECIFICATIONS

Sensor _ Foveon X3 direct image CMOS sensor (23.4 x 15.5mm); 29.5MP on three layers, max image size 39.3MP
Lens mount _ Sigma SA
Memory _ SD/SDHC/SDXC
Viewfinder _ Electronic viewfinder, 2,360,000 dots
Max video resolution _ N/A
ISO range _ 100-6,400
Autofocus points _ 9
Max burst rate _ 3.7fps
Screen _ 3-inch TFT, 1,620,000 dots
Shutter speeds _ 1/4,000 sec to 30 sec, Bulb
Weight _ 625g
Dimensions _ 147 x 95 x 91mm
Power supply _ BP-61 lithium-ion battery (supplied)

The sd Quattro's fine detail rendition is exceptional. Sadly, its high-ISO performance is startling in a very different way

SIGMA'S Quattro sensor mimics traditional film, recording colour using different layers of silicon rather than with the mosaic or red, green and blue photosites used by regular sensors. The top layer records luminance and blue data at 19.6MP resolution, while the green and red layers below record those colours at one quarter that resolution. Sigma says this still delivers true colour data for each pixel and claims "medium-format quality" for the results.

Just as interesting is the body design. The sd Quattro is a solidly made camera that can accept all of Sigma's Art, Sport and Contemporary lenses without an adaptor. That's a smart move.

Build & handling

It's a big old beast, but the sd Quattro handles rather well. The hybrid autofocus system is sluggish at best, however, and occasionally stops trying if the light is poor. And despite its quoted resolution of 2,360,000 dots, the electronic viewfinder image looks a little soft, as if the live feed from the sensor is being upsampled.

The controls and menus are logical enough, though, and once you've learned the controls you'll find the sd Quattro straightforward to operate.

1 The sd Quattro uses Sigma's SA lens mount for use with Sigma's own Contemporary, Art and Sports lenses.

2 Curiously, Sigma's placed the power button on the lens flange rather than on the top of the camera.

3 Sigma's sealed the inside with a glass filter well forward of the sensor plane so that dust spots won't show. Smart!

4 The screen displays shooting information in a dedicated area to the right of the image, rather than over or beneath it.

Performance

The sd Quattro has all the strengths and weaknesses of previous Sigma Foveon cameras. The fine detail rendition is exceptional. Sadly, its high-ISO performance is startling in a very different way. Image quality, particularly saturation, is already falling away badly by ISO 1,600, and at ISO 6,400 the quality is so bad that you wonder if Sigma was wise to include this setting at all. The dynamic range is disappointing too.

This feels like a camera with a lot of promise, but its terrific detail rendition doesn't fully compensate for its other image weaknesses.

Rod Lawton

1

Fine detail

The sd Quattro has no anti-aliasing filter and does not need to 'demosaic' colour data like a conventional sensor – the fine detail rendition is exceptional.

2

Dynamic range

Dynamic range could prove a sticking point. In our tests, highlights were easily blown out and Sigma's Photo Pro 6 software was unable to recover them.

3

Natural colours

As long as you can use low ISOs (up to 400) to capture the scene you're shooting, the sd Quattro produces rich, vibrant but natural-looking colours.

Meet the rivals...

The cameras taking on the sd Quattro...

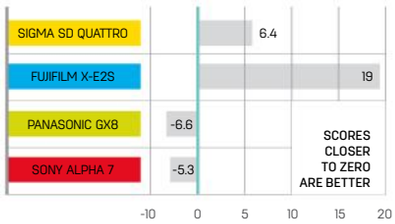
Fujifilm X-E2S
£549/$699 (body)
Like the sd Quattro, this camera has an unusual sensor design. Fujifilm's X-Trans tech delivers strong colours, good definition and strong lens range.
Reviewed Page 58
★★★★½

Panasonic GX8
£770/$998 (body)
This CSC has a smaller sensor than the sd Quattro, but the GX8's 20MP images are good, and the camera delivers speed, features and class.
Reviewed Issue 170
★★★★★

Sony Alpha 7
£799/$1,098 (body)
Sony's first and oldest A7 model is still on sale at knock-down prices. You get full-frame quality for the same price as the sd Quattro.
Reviewed Issue 147
★★★★½

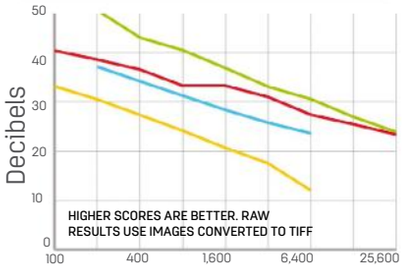
FOR MORE IN-DEPTH CAMERA REVIEWS, VISIT www.techradar.com/cameras

COLOUR ERROR



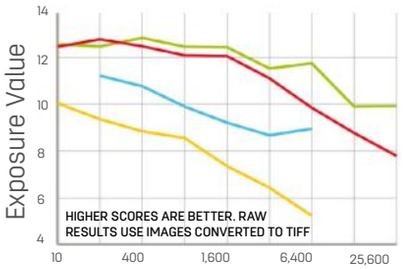
The sd Quattro scores pretty well in our colour error labs tests, and its colour rendition looks vibrant and realistic in real-world tests.

RAW SIGNAL-TO-NOISE RATIO



Controlling image noise is not the Sigma's strong point. Noise levels are tolerable at low ISOs, but ramp up quickly as the sensitivity setting increases to 6,400.

RAW DYNAMIC RANGE



The sq Quattro's contrasty image rendition carries through into the raw files, and highlight detail is easily lost. The results from our lab tests are disappointing.

WE SAY...

The sd Quattro is a solid, well-designed camera backed up by a strong lens range from Sigma. But although the Foveon X3 sensor delivers great detail, it falls behind its rivals for noise control and dynamic range. Worse is the camera's operational speed, notably its autofocus. A good camera undermined by its experimental tech.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★☆☆
VALUE	★★★★☆
OVERALL	★★★½☆

STURDY TRIPODS

Rock-solid carbon-fibre legs for when only the very best camera support will do...

1

www.benroeu.com

Benro GoPlus Classic TGP27C & IB2 head

£309 + £94

THIS new no-compromise design makes a big impression. With an IB2 ball head attached, it'll top out at an imposing 178cm and pack down to a still-unwieldy 73.5cm. That's due to the use of three-section legs, which should be more rigid than four-section designs, even if portability does take a hit. Factor the extra-large diameter carbon tubing, capable of supporting a whopping 12kg, and you get a solid-feeling set-up here.

A monopod conversion feature enhances the GoPlus' appeal, as does the versatile Quick Flip centre column, which easily pivots to almost any angle. Benro also throws in interchangeable spiked feet, while the optional IB2 head impresses with its large, friction-adjustable ball and sound ergonomics.

OVERALL ★★★★★

2

www.gitzo.com

Gitzo Mountaineer Series 1 Kit GK1542-82QD

£839/$1,000

WHERE Benro adopts the 'bigger is better' ethos, Gitzo's entry is just the opposite. Its 170cm maximum height with head is pretty lofty, yet these are the lightest legs on test at just shy of 1.8kg, and the four-section carbon tubes step down to a mere 14.7mm diameter.

Gitzo's exceptional build quality, cutting-edge carbon construction and rock-solid twist-lock extension clamps help the Mountaineer defy its size and stand almost as strong as the Benro. There are no extras like spiked feet or a trick centre column, but the GH1382QD ball head has super-smooth movement, friction adjustment, and a 40mm diameter ball capable of supporting 14kg. The legs, however, are rated for a more modest 10kg.

OVERALL ★★★★½

3

www.manfrotto.com

Manfrotto MT055CXPRO4 & XPRO Ball Head

£279 + £160/$500 + $160

THE 055 packs several small but useful features, like Quick Power Lock leg extension clamps that are easier and faster to use than even the best twist-grip designs. Their positive locking also helps to make the four-section legs feel as rigid as most three-section rivals, and compensate for the slightly spindly 16mm minimum tube diameter.

The leg angle selectors aren't quite so ergonomic, but at least you get Manfrotto's 90° centre column, which can be rotated to sit horizontally, as well as an Easy Link socket to mount accessories. We paired the 055 with the Xpro Ball Head. It boasts a 45mm-diameter ball, superb precision and variable friction, although at 520g it takes the total platform weight north of 2.5kg.

OVERALL ★★★★½

FIVE THINGS TO LOOK FOR...

1 SPLIT DECISION Three-section legs cut down on joints, but four sections that stretch to the same height pack smaller.

2 WEIGH IT UP Carbon-fibre maximises stiffness and minimises weight, but aluminium is a cheaper alternative.

3 SURE-FOOTED Oversize rubber feet are good to grip the ground, as is the ability to fit spikes for loose surfaces.

4 TOP IT OFF Large-diameter ball heads will help steady a big camera set-up, as will adjustable friction.

5 FUN FRILLS Some can be converted to a monopod, while others boast vari-angle centre columns.

4

www.nest-style.com

Nest Traveller NT-6294CK Carbon Fibre Tripod / Monopod Kit

£300

THANKS to legs that flip up to surround the head, this tripod packs down to just 45cm, yet the four-section legs and centre column still extend to a respectable 166cm at full stretch. The large-diameter eight-layer carbon tubes and twist-grip extension locks aren't quite as rigid as the Benro or Manfrotto legs, but they'll hold steady under a large SLR and 70-200mm lens.

Despite its relatively low price, you still get a monopod conversion, with a fully-featured head boasting friction control, two bubble levels and a fairly large 32mm-diameter ball. It tips the scales at 275g, contributing to an all-in weight of 1.85kg. The only downsides are a centre column that won't pivot, and you can't add spiked feet.

OVERALL ★★★★½

5

www.novo-photo.com

Novo Explora T10 with CBH-40 ball head

£229

NOVO is a new name in the tripod market, but its Explora T10 is worth the effort of seeking out. This'll pull the detachable monopod trick, and it includes long and short centre columns for low-level shooting. The rubber feet can be removed to reveal spikes, while the included CBH-40 ball head is silky smooth with a large ball diameter and variable friction. You can rotate the camera mounting plate while the ball is locked.

Weighing in at 1.8kg means these legs rival the Gitzo as the lightest here, and at 49cm long when packed, only the Nest compresses more. Four-section legs give a 171cm maximum shooting height, but their twist-grip extension locks – while holding steady – don't give the instant grip rival designs.

OVERALL ★★★★½

6

www.vanguardworld.com

Vanguard Alta Pro 283CB100

£300/$370

LIKE Benro, Vanguard has opted to use three-section legs for added rigidity, and it has the same side-effect of increasing packed length to a bulky 72.5cm when fitted with the included SBH-100 ball head. It results in a handy 180cm extended height however, and Vanguard's Multi-Angle Central Column rivals Benro's Quick Flip column, helping you snap low-angle and macro shots.

Grippy rubber feet can be retracted to reveal spikes, while foam pads wrap the top of all three legs, and you can pivot the legs to 20, 50 or 80°. Twist-grip leg locks keep the eight-layer carbon tubes from compressing under an 8kg load capacity, but they have a fraction more lateral play than Benro's clamps, reducing the benefit of the three-section legs.

OVERALL ★★★★½

CSC www.sony.com

Sony Alpha 6300

£849/$999 (body only)

With a fresh AF system and 4K video, the A6300 aims to set the bar high for the enthusiast user

SPECIFICATIONS

Sensor _ 24.2MP APS-C Exmor
Focal length conversion _ 1.5x
Memory _ SD/SDHC/SDXC(inc UHS-I)/ Memory Stick Pro Duo
Viewfinder _ 0.39-inch OLED EVF; 2.36 million dots
Max video resolution _ 4K UHD (3,840 x 2,160) up to 60p
ISO range _ expandable to 51,200
Autofocus points _ 425 points (phase-detect AF); 169 (contrast-detect AF)
Max burst rate _ 11fps
Screen _ 3-inch LCD, 921k dots, tiltable
Shutter speeds _ 30-1/4,000 sec, Bulb
Weight _ 404g (including battery and memory card)
Dimensions _ 120 x 67 x 49mm
Power supply _ Rechargeable Li-Ion battery (NP-FW50)

The new 24.2MP Exmor CMOS sensor is more efficient at gathering light and reading out info than the A6000

SONY has done a stellar job to get its Alpha line of compact system cameras and lenses firmly established in the mirrorless camera market, with everyone from complete beginners to demanding professionals now catered for. Plenty of focus has been placed on Sony's most recent Alpha 7 full-frame models, although it scored a big hit with the more junior A6000 before this – and now it seeks to repeat its success with the A6300.

Features

The A6300 may look similar to the camera it updates, but a handful of changes on the inside show it to be a much mightier proposition for the enthusiast. It has been constructed around a new 24.2MP Exmor CMOS sensor, which is said to be more efficient at gathering light and reading out information than the A6000. This also allows it to offer 4K video recording, a feature that Sony is strongly pushing through on cameras of all levels.

The sensor also offers an unprecedented 425 phase-detection AF points, plus 169 contrast-detection points. This combination is said to ensure that focus is swift against static subjects – focusing in as little as 0.05 sec – and capable of keeping up pace with moving ones.

There's also the familiar sight of a tilting three-inch LCD screen, with 921,000 dots for clarity, but sadly no touch operation. The 2,359,000-dot electronic viewfinder above this has been upgraded from the 1,440,000-dot version on the A6000. Sony has also thrown in the option of shooting at up to 11fps with focus and auto-exposure maintained throughout, as well as Wi-Fi and NFC for easy image sharing.

Build & handling

All of this is wrapped up in a magnesium alloy body that's designed with improved dust and moisture resistance over the A6000, as well as a sturdier lens mount. The

1 The 16-50mm Power Zoom kit lens adds only a little to the camera's profile.

2 Not only does the A6300 offer a built-in flash, but there's also a hotshoe.

3 The Fn button brings up commonly used options, and these can be customised.

4 The camera's rear screen can be tilted up and down, but it's not sensitive to touch.

Although the A6000's viewfinder was a good performer, it's great to see this being made even better here with a higher resolution panel

grip is large and deep, and well rubbered for comfort, although larger-handed users might prefer this to be even deeper.

Controls are plentiful around the back of the camera, and a good level of customisation is possible. The control wheel at the rear moves freely enough for quick menu scrolling and option selection. The command dial on the top plate has a pleasing stiffness to it, although there can be a slight disconnect between its turning and the camera responding.

The LCD screen pulls away easily from the back plate: this makes viewing it in more awkward shooting positions easier, although when extended it can get in the way of certain controls, such as the commonly used Fn button and the rear control wheel.

Performance

Although the A6000's viewfinder was a good performer, it's great to see this being made even better here, with a higher-resolution panel. It's crisp and high in contrast, and only troubled by a little noise in darker conditions. The LCD screen's specifications aren't quite class-leading, and at default settings it appears somewhat under-powered and in need of a boost in brightness through the menu, although it otherwise performs as you would expect.

The camera's revamped focusing system is one of its main highlights, and it's pleasing to discover that it delivers. There's very little delay when focusing on everyday subjects, while performance against moving subjects is also strong. The spread of focusing points, almost up to the peripheries of the frame, ensures that the system stays with the subject well wherever it moves. Objects travelling in a variety of directions and speeds relative to the camera are picked up and >

1 **Colour**
The camera's Vivid Creative Style has given the greens and reds in this image a pleasant boost, without oversaturating them.

2 **Out-of-focus areas**
Captured at f/4 with the Carl Zeiss Vario-Tessar T* E 16-70mm f/4 ZA OSS, the out-of-focus areas in this scene appear smooth.

3 **Exposure**
This shows the camera's slight tendency to under-expose on occasion. This image benefits from +0.5EV over-exposure to make it more balanced.

Meet the rivals...

The cameras taking on the Sony A6300...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Olympus Pen F
£899/$999
The latest Pen model from Olympus oozes style, but it's just as impressive on the inside, with a cracking EVF and high-quality images.
Reviewed Page 86
★★★★½

Panasonic GX8
£574/$998
The GX8 has an excellent 20MP sensor to recommend it, together with a fast AF system, 4K video – and a great price.
Reviewed Issue 170
★★★★½

Fujifilm X-E2S
£549/$699
With a 16MP X-Trans CMOS sensor and X-series glass, Fujifilm's compact and affordable rangefinder-style is worth a closer look.
Reviewed Page 58
★★★½

Above The camera's electronic level makes it easy to capture images completely horizontal (or vertical) – important in scenes where linear details make any slight skewing more apparent.

Above Comparing this JPEG with the corresponding raw file shows the camera has done a great job boosting contrast and colour. Sharpness is also just at the right level.

Above The camera's Auto White Balance system keeps colours faithful under a range of conditions. This image was captured under a mixture of daylight and various artificial sources.

adhered to well. Every now and again the system does get a little distracted and venture off elsewhere but, to be fair, this is true of many similar systems.

When set to burst shooting, Sony claims the camera can record 21 consecutive raw frames or the same number of raw+JPEG frames, and 44 JPEG frames at the highest quality setting – and with a fast memory card in place it manages to do just this. 4K videos looks crisp and detailed, and even when light levels fall there's just a slight noise visible in footage rather than anything more disagreeable, with footage pleasingly free from aberrations.

Audio quality is also very good, although using an external microphone is advised as the camera joins many others in being susceptible to picking up wind noises when shooting outside.

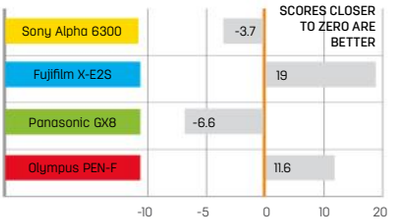
Noise is well controlled in images, and usable results are still possible at settings as high as ISO 6,400, although you may wish to adjust noise reduction (or process the raw versions) as the camera's noise reduction system can leave images lacking in detail. Images straight out of the camera show the A6300's JPEG processing does a fine job, with pleasing colour, contrast and sharpness. (You may find that you wish to nudge up a little at times, particularly when shooting very detailed subjects).

The camera's Dynamic Range Optimizer also does a fine job to reveal more detail in shadowy areas, helping images to appear balanced, which is just as well as the metering system can occasionally under-expose the odd frame. Exposure compensation is very easy to apply, though – and usually only around +0.5EV is all that's required.

Matt Golowczynski

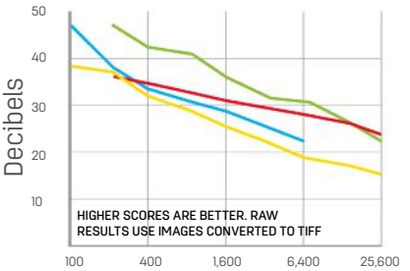
Images straight out of the camera show the A6300's JPEG processing does a fine job with pleasing colour

COLOUR ERROR



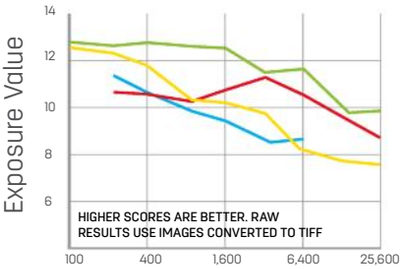
The Sony A6300 does a great job with colour accuracy in JPEGs. Only the rival Alpha 7 II shows a marginally better performance out of the models tested here.

RAW SIGNAL-TO-NOISE RATIO



A slightly disappointing performance across the camera's full sensitivity span here, with a signal-to-noise ratio that's either the same or lower than the others at every setting.

RAW DYNAMIC RANGE



The A6300 doesn't fare too badly for raw dynamic range at its lowest sensitivities, although as ISO increases, its performance is largely outgun by the other cameras here.

WE SAY...

Although a comparison with its immediate rivals shows the A6300 to slip a little with dynamic range and noise, when viewed in isolation it performs well. It's packed with features, focuses promptly and accurately, and records superb video. While it's not cheap, you get a lot of camera for your money.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★½
VALUE	★★★★☆
OVERALL	★★★★☆

SLT www.sony.com

Sony Alpha 68

£513/$599 (body only)

The A68 combines a number of enthusiast-level features from the A77 II with an entry-level price

SPECIFICATIONS

Sensor _ 24.2MP APS-C Exmor CMOS
Crop Factor _ 1.5x
Memory _ SD/SDHC/SDXC (inc UHS-I), Memory Stick Pro Duo
Viewfinder _ 0.39 inch OLED Tru-Finder, 1.44 million dots
Max video resolution _ Full HD (1,920 x 1,080) up to 60p
ISO range _ 100-12,800 (expandable to 25,600)
Autofocus points _ 79 points
Max Burst rate _ 8fps
Screen _ 2.7 inch LCD, 461k dots
Shutter speeds _ 30-1/4,000 sec, Bulb
Weight _ 596g (body only)
Dimensions _ 143 x 105 x 83mm
Power supply _ Rechargeable lithium-ion battery (NP-FM500H)

A plethora of physical controls provide direct access to many shooting parameters

SONY'S Alpha 77 II made quite the impression when it was launched in 2014, and proved that there was plenty of life left in the company's SLT systems, despite the popularity of Sony's full-frame CSCs. That camera remains in the Alpha stable – although with the Alpha 68, Sony is now looking to tempt those wanting similar functionality inside a more affordable body.

Features

The new arrival joins its elder sibling in offering a 24.2MP APS-C sensor, as well as the 4D Focus system. This features an impressive 79 phase-detect AF points, 15 of which are cross-type for enhanced sensitivity. The camera's Translucent Mirror Technology allows this to remain operational when using the LCD for image composition too, and autofocus continues to work when capturing bursts of images at a rate of up to 5 frame per second (or 8fps in a cropped format).

Autofocus is also maintained when capturing Full HD videos; these are recorded using the same XAVC S codec as Sony's more advanced 4K-capable models. The electronic viewfinder features a 1.44-million-dot panel for excellent clarity, although the tiltable LCD screen beneath it not only measures just 2.7 inches but also only manages to offer a paltry 461,000 dots.

The camera mirrors the design of the A77 II in offering a top-plate LCD screen and a control wheel at the rear, a partnership that provides a shooting experience akin to those of enthusiast SLRs. A plethora of physical controls provide direct access to many shooting parameters, and it's possible to customise many controls should anything not be as close to hand as desired.

1 The grip is substantial enough to get a comfortable hold, and very well rubbered to further improve handling.

2 The 2.7 inch LCD is small but it can be pulled away from the body and tilted.

3 A control wheel on the back of the camera provides an experience rather similar to using an enthusiast SLR.

Build and handling

Build quality is one area where the camera's low price point may be explained: while we certainly don't expect a robust magnesium-alloy

Viewing the JPEG next to the raw version shows the Dynamic Range Optimizer has lifted shadowy areas in the trees.

casing at this level, the smooth polycarbonate used doesn't feel quite as refined as rival models. The grip, however, is pleasingly deep and contoured, and makes for superb handling – particularly when trying to support weightier optics.

Shooting is made awkward by the lack of travel between the shutter release button's focused and release positions; in practice this makes it easy to take images when you simply want to focus on the subject. The control wheel on the back plate also doesn't stand proudly enough from the body for comfortable turning.

The LCD screen is as underwhelming a performer as its specs suggest, with a general lack of contrast and clarity, and a poor viewing angle. (The latter is somewhat mitigated by its ability to be tilted.) The electronic viewfinder fares much better, with a decent dynamic range and its higher resolution making checking focus and details much easier.

Performance

Sony has placed a great deal of attention on the A68's focusing system in its marketing: using it makes it obvious why. For a model

1 **Sharpness**
At a focal length of 55mm and an f/9 aperture, the kit lens shows a little softness in the corners of the frame.

2 **Exposure**
The metering system has exposed appropriately, although some may prefer +1/3EV exposure compensation.

3 **Auto White Balance**
Thanks to an effective white balance system, colours have remained faithful and neutral areas show no particular casts.

Meet the rivals

The cameras taking on the Alpha 68

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon EOS 760D
£509 / $849 (body only)
The EOS 760D also features a top-plate LCD and 24.2MP sensor, as well as compatibility with decades worth of top lenses.
Reviewed Page 22
★★★★★

Nikon D5500
£569 / $697 (with 18-55mm lens)
With an articulating touchscreen, built-in Wi-Fi and a 24.2MP sensor that lacks a low-pass filter for detail, the D5500 packs a punch.
Reviewed Page 18
★★★★½

Pentax K-S2
£529 /$529 (with 18-50mm lens)
The weather-resistant K-S2 boasts an optical viewfinder with 100% coverage, plus an articulating LCD for creative flexibility.
Reviewed Issue 165
★★★★½

Captured at ISO 1,250, noise reduction has robbed some of the finer details from this scene, although it's still possible to identify many single hairs in focused areas.

of its class, it performs to a superb standard, typically acquiring focus in impressively little time, and doing well when tracking moving subjects, partly on account of the high saturation of points in the centre of the frame.

I found it was perfectly possible to achieve around 56 Fine JPEGs and 37 Extra Fine JPEGs on the camera's JPEG-only, cropped 8fps option, and around 21 Extra Fine frames and 33 Fine frames when shooting at 5fps (at full resolution). On the latter mode, only around seven or eight raw frames can be captured, though, so this is something to consider if you intend on using burst shooting with some frequency.

The camera's metering system does a fine job of keeping exposure balanced in the majority of situations, although it does display a tendency to underexpose in the presence of highlights.

The Sony Alpha 68's Dynamic Range Optimizer is a very useful feature to keep activated, as this does well to bring up any shadows and tame the highlights where necessary.

The screen isn't great, but it is tiltable.

Colours are generally accurate when using the Standard Creative Style. This is also partly down to the work of the Auto White Balance system, although I often found more pleasing results on the Vivid, Autumn Leaves or another setting; sometimes the Standard option is a little too neutral for print- or web-ready results.

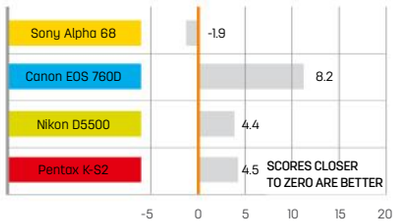
Images captured on lower sensitivities are nice and clean, but noise begins to appear from ISO 400 or so – even in images captured in good conditions. Results from around ISO 3,200 onwards are usable at smaller sizes, but noise and noise reduction are evident. The camera's sensor-based image stabilisation system is effective at boosting stability and maintaining sharpness at slower shutter speeds, however, so it's a good idea to keep this on for hand-held shooting.

As we'd expect from a company with Sony's heritage, video quality is also very good. While the option to record in a 4K resolution is absent, Full HD footage contains very good detail and audio quality is also reasonably clear on default settings, although you can always opt to connect an external microphone to the camera should you want to capture this with greater clarity.

The advantage of Sony's Translucent Mirror Technology also makes itself apparent here, with smooth autofocusing while recording, however you can choose to use manual focus for greater control where necessary.

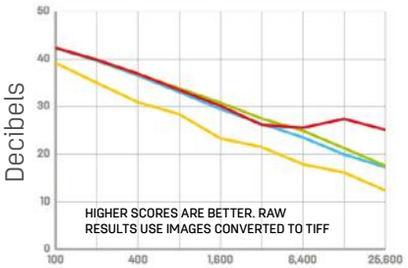
Matt Golowczynski

COLOUR ERROR



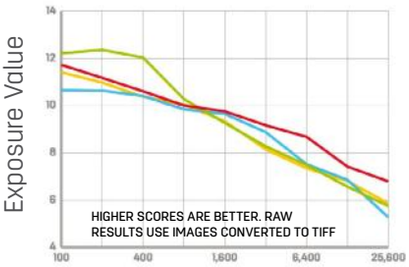
One area where the A68 shines is its colour accuracy: next to its rivals, it manages to do a better job to faithfully reproduce colours.

RAW SIGNAL-TO-NOISE RATIO



Noise is well controlled in JPEGs; raw files tell a very different story. Here, the A68 scores consistently lower throughout the ISO range than the competing cameras.

RAW DYNAMIC RANGE



The A68 doesn't fare too badly for dynamic range in raw files captured at lower sensitivities, although it soon starts to slip behind its competitors – albeit not by much.

WE SAY...

The A68 is something of a mixed performer with a powerful AF system, excellent handling and a decent viewfinder to recommend it, but lacklustre build quality, a poorly performing LCD and noisy images let it down. It's a great option for those shooting action, but if you want a more flexible camera, it may be better to look to an alternative solution.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★½☆
VALUE	★★★★½
OVERALL	★★★★☆

UHS-I SD CARDS

Five fast SD cards for flawless 4K recording and burst shooting

www.kingston.com

Kingston SDXC UHS-I U3 64GB

£23/$34

Kingston's fastest SD card managed a whopping 84.1MB/s when writing video, though transferring multiple image files resulted in a mediocre 42.8MB/s, with lots of speed fluctuations.

OVERALL ★★★★☆

www.lexar.com

Lexar Professional 633x SDXC UHS-I 64GB

£23.50/$30

It may only have a UHS Class 1 speed rating, but this card's read rates are a match for the competition. Write speeds of 53MB/s with video and 36.7MB/s with images trail the pack, though.

OVERALL ★★★½☆

www.samsung.com

Samsung Pro+ 32GB

£25/$25

The Pro+ turned in the fastest outright image write rate of 58.2MB/s, but not without some minor speed fluctuations. Read performance is faultless, however, as is video write speed.

OVERALL ★★★★½

WHAT TO LOOK FOR

1 **MAXIMUM SPEED**
Usually quoted in MB/s, this is the highest speed the card can achieve, but not necessarily sustain. It's most relevant for stills photography.

2 **CLASS RATING**
The minimum sustained speed – very important for video. The new UHS speed ratings are Class 1 (minimum 10MB/s) and Class 3 (30MB/s).

We tested these cards' read/write speeds for both images and video, recording overall transfer times and read/write fluctuations which could result in dropped video frames. All these cards are UHS-I types, with a single row of contacts on the back. UHS-II SD cards have a second row of contacts, offering up to three times the theoretical speed, though you need a compatible camera.

www.sandisk.com

SanDisk Extreme Pro 32GB

£25/$20

SanDisk's contender produced a blistering 83.3MB/s video write rate, and it wrote images at a sustained 56.4MB/s with no speed dips, making it the smoothest performer here.

OVERALL ★★★★★

www.transcend-info.com

Transcend SDXC UHS-I U3 64GB

£25/$28

Despite sharing the same speed class ratings as SanDisk's entry, this card only managed an erratic 36.8MB/s average image write speed. 64MB/s when writing video isn't too shabby, though.

OVERALL ★★★½☆

CSC www.sony.com

Sony Alpha 77 II £999/$999 (Body only)

Sony's enthusiast-level Alpha 77 II gets a speed boost as well as better image quality. ***Angela Nicholson*** *checks it out*

SPECIFICATIONS

Sensor _ 24.3MP APS-C format (23.5 x 15.6mm) Exmor CMOS
Focal length conversion _ 1.5x
Memory _ SD/SDHC/SDXC and Sony Memory Stick
Viewfinder _ Electronic viewfinder with 2,359,296 dots (100% cover)
Video _ Full HD (1,920 x 1,080) at 60p
ISO range _ 100 to 25,600; expandable to ISO 50-25,600 for stills, ISO 100-12,800 for movies
Autofocus points _ Phase-detection with 79 points (15 cross-type)
Max burst rate _ 12fps (aperture locked at start)
Screen _ 3.2-inch, 1,229k-dot TFT
Weight _ 647g (body only)
Dimensions _ 142.6 x 104.2 x 80.9mm

Almost all of Sony's A-mount lenses are compatible with the A77 II's 79 AF points

AFTER the announcement of the full-frame E-mount Sony A7, A7R and A7S compact system cameras and the demise of the NEX brand, you could be forgiven for thinking that Sony might not continue with its A-mount SLT (single lens translucent) cameras. However, the arrival of the Sony Alpha 77 II indicates that this isn't the case.

As you might guess, the Alpha 77 II replaces the Alpha 77, which is now discontinued, and it has an almost identical shape and design. As before, the new camera is aimed at enthusiast photographers who want a step up from an entry-level model. It sits under the full-frame Alpha 99 in Sony's SLT line-up.

Features

Like the Alpha 77, the A77 II has a 24-million-pixel sensor, but this is a new device that benefits from the progress that has been made with sensor design in the two-and-half years since the A77 first arrived. Also, for the first time in an A-mount camera, the sensor signal is processed by a Bionz X engine. This has given Sony the confidence to allow sensitivity to be set in the native range ISO 100-25,600 for still images, with a low expansion setting of ISO 50 also available.

One of the benefits of the SLT design is that there can be full-time phase-detection autofocus during movie shooting and when composing images on the rear screen. Sony has used a newly developed phase-detection sensor with 79 AF points (15 of which are the more sensitive cross-type) in the Alpha 77 II. Sensor development means that the A77 II's CCD AF sensor produces less electronic noise than previous devices and this helps with autofocusing speed and accuracy, as well as boosting low-light performance.

Spot AF performance is also claimed to have been improved, with weighting given to the centre of the spot. There's a collection of AF-point selection options including Wide, Zone, Flexible Spot, Local, Expanded Flexible Spot and Lock-on AF. In Expanded Flexible Spot mode, you select one AF point and the camera

1 The mode dial has been updated with a lock button to prevent it from being knocked out of position.

2 The hotshoe has changed from the Sony (Minolta) proprietary shape to the more common universal style. It also has contacts for a wide range of accessories.

3 This controller makes it quick and easy to select the desired autofocus point in your scene.

4 The vari-angle mechanism on the rear LCD screen seems a little over-complicated.

Using the Landscape Creative Style boosts blues and greens.

supports this with the surrounding eight points, which is useful when shooting a moving subject.

It's also possible to adjust the AF tracking duration across five levels via the menu. The low settings are useful when the subject distance isn't expected to change quickly, while high levels suit shooting subjects at different distances. In addition, a new AF Range Control option allows you to restrict the AF to working within a specific distance range – useful when there are objects between the camera and the subject.

According to Sony, almost all of its A-mount lenses are compatible with the 79 AF points, although only 61 are available when you're shooting at 12fps. Sony's 500mm f/8 lens is a notable, but not surprising, exception: it will allow only the centre AF point to be used.

As suggested above, the A77 II can shoot a maximum rate of 12 frames per second with AF tracking, and the buffer has capacity to allow up to 25 raw and JPEG images to be captured in a single burst, but aperture is locked at the start of the sequence.

Other pleasing additions to the A77 II's featureset include an HDMI port, which can supply clean video output to external storage devices, and Wi-Fi connectivity. As the A77 II has an NFC chip, owners of NFC-enabled smartphones and tablets can connect to the camera by touching the two devices together. Interestingly, despite the presence of Wi-Fi connectivity, the A77 II cannot make use of Sony's PlayMemories Camera apps.

The articulating hinge seems unnecessarily complicated, and it takes a while to get used to it

Build and handling

Sony has given the Alpha 77 II the same tough feel, overall shape and control layout as the A77, and the vertical grip that was produced for the original model can be used with the new camera. There are a few differences, however: there are 27 features that can be assigned to one of the 12 slots in the Function menu, for example. It's also possible to customise the function of many of the buttons, but the default settings work well.

If you like using Picture Effects (Toy Camera, Pop Color, Posterization, Retro Photo, Soft High-key, Partial Color, High Contrast Mono, Soft Focus, HDR Painting, Rich-tone Monochrome, Miniature, Watercolor and Illustration are provided), it's worth assigning this and image quality to the Function menu so that you can quickly turn off raw recording and access the effects. As with other Sony cameras, the Creative Style options (Standard, Vivid, Neutral, Clear, Deep, Light, Portrait, Landscape, Sunset, Night, Autumn, Black & White and Sepia), which give JPEG images a particular appearance, can be used when shooting raw images simultaneously.

While the three-inch 1,229k-dot vari-angle screen is useful for composing images from awkward angles, the articulating hinge seems unnecessarily complicated, and it takes a while to get used to its quirks and limitations. The hinges on cameras such as the Canon 70D and Nikon D5300 are much more straightforward.

As on the Sony A7 and 7R, the 2.3-million-dot electronic viewfinder

Meet the rivals...

There's a choice of SLRs and CSCs at this price point

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon EOS 70D
£734 / $899
Now getting harder to find new, this 20.2MP SLR has a responsive vari-angle touchscreen, and takes great images.
Reviewed Issue 144

Nikon D7100
£609 / $697
A 24.1MP SLR with superb resolving power and an excellent AF system, but limiting buffer capacity.
Reviewed Issue 136

Fujifilm X-T1
£795 / $1,299
This stylish SLR-style CSC has an excellent electronic viewfinder and traditional exposure controls.
Reviewed Issue 151

(EVF) is bright and clear, with plenty of detail visible. As usual with an EVF, this brings the benefit of seeing the image as it will be captured. However, when the brightness is set to Automatic rather than manual, the extra gain applied in dark conditions can mean that the viewfinder image looks significantly brighter than the final image, so it's best to set the brightness to Manual.

Performance

Even at the highest selectable sensitivity setting of ISO 25,600, noise is controlled well in raw files, having a fine texture with no banding or clumping visible at 100% on-screen. With careful processing, it's possible to conceal most of the coloured speckling in raw files and produce an image with just luminance noise giving some grain. Simultaneously captured JPEG files look softer than their raw counterparts, and close examination reveals a painterly texture with slightly sharpened edges. They generally look acceptable viewed at A3 size, but we prefer the slightly sharper, grainer look of the raw files.

As you'd hope with a 24MP sensor, the A77 II is capable of recording a high level of detail at the lower sensitivity settings.

While the A77 II's AF system struggled a little more than the Canon 5D Mark III in the low, flat light of an unlit music gig, there were no such problems with a fast-moving subject in good light. It was positive, fast and accurate. In continuous AF mode with AF selection set to Expanded Flexible Spot, it got rowers sharp in a flash and was able to keep them sharp by using the surrounding points when panning. When AF selection was set to Lock-on AF: Flexible Spot or Lock-on AF: Expanded Flexible Spot, it also tracked them around the frame if the original AF point wasn't kept in the correct location.

As usual, AF performance varies according to the lens that's mounted, and a good optic is required to get the best from the Alpha 77 II. It performs very well with the 70-200mm f/2.8, for example, but is a little more hesitant in low light with the 85mm f/2.8 – which also has a much noisier focus mechanism.

We used the Multi-segment metering system almost exclusively during this test. Although we shot in a wide range of conditions, there were only a few when a little exposure compensation was required.

Colours are also good straight from the camera, and the white balance system general does a good job when set to the Automatic setting.

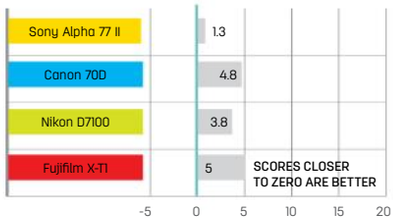
Verdict

While the changes made to the Alpha 77 II may not seem dramatic, Sony has worked on the most important aspects – the sensor and processor – to boost speed and image quality, as well as the autofocus performance. Many will recognise that it's sensible to stick with the same pixel count as with the Alpha 77: 24 million pixels capture enough detail for most purposes and allow big prints to be made. The files are large without being unmanageable by the average modern computer.

The AF system improvements and the A77 II's ability to control noise at high sensitivity levels, combined with the general high quality of the images, makes it a versatile camera that will be attractive to enthusiast photographers who want to shoot a wide range of subjects in a variety of conditions.

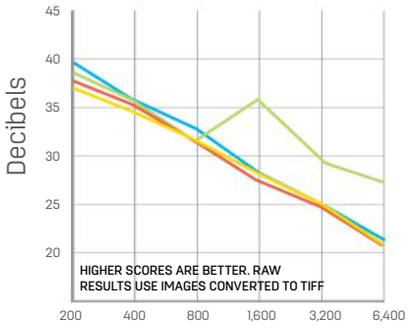
Angela Nicholson

COLOUR ERROR



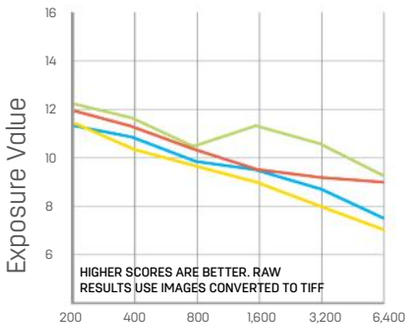
Our tests show that the Alpha 77 II is comfortably the most accurate camera in this group.

RAW SIGNAL-TO-NOISE RATIO



The A77 II is one of the lower performing cameras here, but as with the JPEG images, this may be to reveal more detail.

RAW DYNAMIC RANGE



The Sony Alpha 77 II's raw file dynamic range lags behind competing cameras through most of its sensitivity range.

WE SAY...

The A77 II's image quality is excellent, even at high sensitivity settings, and the autofocus system is fast and accurate. It's a great choice for enthusiasts who want versatility from their camera.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★★☆
OVERALL	★★★★½

CSC www.sony.com

Sony Alpha 7R II £2,899/$3,198

Sony's highest-resolution CSC proves you don't need a big camera to create large, high-quality images

SPECIFICATIONS

Sensor _ 42.4 million effective pixel full-frame (35.9 x 24mm) Exmor R CMOS
Focal length conversion _ 1x
Memory _ SD/SDHC/SDXC and various Memory Stick options
Viewfinder _ 2,359,296-dot OLED
Max video resolution _ 4K (3,840 x 2,160) at 30p
ISO range _ 100-25,600; expandable to ISO 50-102,400 for stills
Autofocus points _ 399
Max burst rate _ 5fps at full resolution
Screen _ 3-inch LCD with 1,228,800 dots
Shutter speeds _ 30-1/8,000 sec for stills
Weight _ 582g (body only)
Dimensions _ 126.9 x 95.7 x 60.3mm
Power supply _ NP-FW50 lithium-ion battery (supplied)

The front grip is more pronounced, making it more comfortable and secure in use

SONY has had ambitious plans for the camera market ever since it bought Konica Minolta's camera business in 2006, but after the initial excitement there were only sporadic periods of activity, and our attention waned somewhat. Then in September 2013 the company launched the RX1, a small compact camera with a full-frame sensor, and it seemed that there would be more of interest to follow.

A little over a year later, the Alpha 7 and 7R were unveiled, and we all sat up and took notice. These were the world's first compact system cameras to feature full-frame sensors. Since then, we've had the Alpha 7S and the Alpha 7 II.

The latest addition to the range is the Alpha 7R II, the highest-resolution model which trumps the A7R's 36 million pixels with an effective pixel count of 42.4 million. To push detail resolution even further, the sensor has no optical low pass filter (OLPF). As well as having the first full-frame backside illuminated (BSI) sensor, the A7R II is the first full-frame camera to feature in-body five-axis image stabilisation and the ability to record 4K movies internally.

Other specification highlights include Sony's Bionz X processor, which enables a maximum sensitivity setting of ISO 102,400; a 399-point hybrid autofocus system; a new 500,000-cycle life shutter unit that creates less vibration than before; and a 2,359,296-dot OLED electronic viewfinder (EVF).

1 It's relatively easy to connect an NFC or Wi-Fi enabled phone to control the camera or share images.

2 The electronic viewfinder makes the scene look a little more vibrant than it is in reality, but the images are a good match for the scene.

3 We found this dial a bit awkward to reach while holding the camera one-handed.

4 This lock prevents the mode dial from being accidentally knocked out of position.

Build & handling

Like the other cameras in the Alpha 7 line, the A7R II has retro SLR-like design. However, Sony has taken on-board some of the criticisms made of the original A7 and A7R and make the same handling tweaks to the A7R II as it did to the A7 II. Consequently, the front grip is more pronounced, making it more comfortable and secure in use. The shutter release button is also moved forward onto the top of the grip, and beneath it there's a conveniently placed recessed dial for adjusting settings. This has created space for a second

Our best shot

WHAT WE LOVE ABOUT THE A7R II

1
Detail
The Sony A7R II is able to resolve a very impressive level of detail. The fabric of the umbrella is clearly visible in the droplets of water.

2
Depth of field
Having a full-frame sensor means there's lots of control over depth of field. The softness of out-of-focus areas seems to be emphasised by the sharpness of areas in focus.

3
Get it right
You can rely on the auto white balance and 1200-zone evaluative metering systems to deliver accurate colours and exposures, even in tricky lighting conditions.

Using an electronic viewfinder makes it easier to produce creative images in-camera; this scene looked far better overexposed by +1.7EV.

Three of the navigation buttons and the centre button can also be used as shortcuts to features

customisable button on the camera's top-plate.

The A7R II has a magnesium alloy construction and is weather-sealed. Most of the camera feels very solid, with a pleasant density, but the front grip creaks when it's held tightly.

One of the great things about the A7R II is that it's highly customisable. The control wheel on the back of the camera, for example, can be set to adjust one of six features – I found it useful for adjusting sensitivity quickly – and any of 62 functions can be assigned for access via four Custom buttons. Three of the navigation buttons and the centre button can also be used as shortcuts to features, and 12 of 34 functions can be assigned for access via the Function menu.

The default set-up makes a good starting point, but it's worth experimenting with other options until you have the optimum control arrangement for your needs.

Meet the rivals...

The cameras taking on the Sony A7R II...

FOR TEST IMAGES AND RESOLUTION CHARTS, VISIT www.techradar.com/cameras

Canon EOS 5DS
£2,799/$3,499
Along with the 5DS R, this 50-million-pixel SLR is the highest resolution full-frame camera currently available – and it certainly packs in the detail.
Reviewed Page 46
★★★★★

Nikon D810
£2,214/$2,997
With 36 million pixels on its full-frame sensor, this SLR can't quite match the Canon 5DS for detail, but it's still a top choice for Nikon lovers.
Reviewed Page 46
★★★★★

Sony Alpha 7R
£999/$1,898
This 36MP CSC turned lots of heads when it was first unveiled. It produces superb images, making it a great and more affordable alternative to buy.
Reviewed Issue 147
★★★★½

Performance

One thing that's clear from our real-world and lab tests is that the Alpha 7R II can resolve a lot of detail. As you'd expect, the highest level of detail is captured at the lowest sensitivity settings.

I found it impossible to match the JPEGs' in-camera processing when processing raw files using the supplied software, and the JPEGs resolve very slightly more detail. It doesn't quite out-resolve our resolution chart, so it can't match the 50MP Canon 5DS for detail. As sensitivity increases to mid-range values, the JPEGs take on a slightly

These particular lighting conditions pushed the Sony A7R II's autofocus system, but it still managed to deliver a sharp result with the FE 70-200mm f/4 G OSS lens mounted.

painterly appearance at 100% on-screen. This becomes even more evident at high values and the edges of elements become a little harsh while the areas in-between are a softer wash of colour.

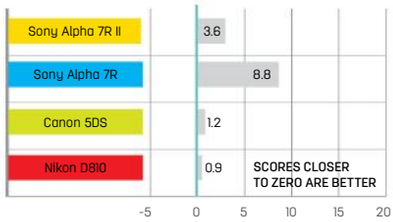
Noise levels are perfectly acceptable throughout the native sensitivity range (ISO 100-25,600), but I'd avoid the high expansion settings unless getting a shot is more important than its quality.

The A7R II's autofocus (AF) system is pretty good. It's capable of getting moving subjects sharp quickly, and can even follow them around the frame in fairly low light provided there's a reasonable level of contrast. When this drops, it can become rather ponderous. It's also hard to predict exactly where the focus will be when using Lock-on AF. Although it does a good job of tracking a subject, in practice the precise point of focus may turn out to be slightly off where you want it to be.

Angela Nicholson

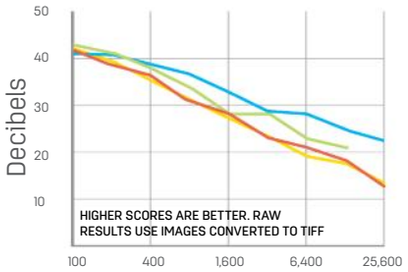
Noise levels are perfectly acceptable throughout the native sensitivity range (ISO 100-25,600)

COLOUR ERROR



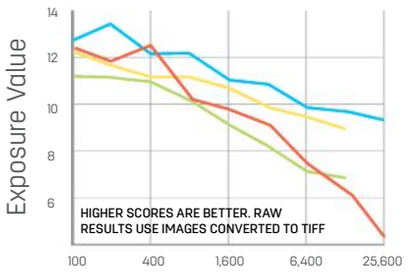
This indicates that the Alpha 7R II produces slightly less saturated images than the original version, but they are still a little more saturated than the images from the Canon and Nikon competition.

RAW SIGNAL-TO-NOISE RATIO



The A7R II competes well with the Canon and Nikon cameras, and noise is kept well hidden for much of the sensitivity range. Its JPEGs have impressively high scores.

RAW DYNAMIC RANGE



Dynamic range is down on the original A7R, but it still compares favourably with that of the Canon 5DS, indicating that it captures a wider range of tones in a single image.

WE SAY...

Although it has a high pixel count and can record lots of detail, the Alpha 7R II needn't be limited to use on a tripod, and its autofocus system is capable of getting moving subjects sharp. It's also highly portable and customisable. Although Sony is working on it, the lens range is a little limited.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

CAMERA PHONES

Find out which of the latest and greatest smartphones boasts the best camera

www.apple.com

Apple iPhone 7 Plus

From £719/$769

THE 7 Plus stands out from its smaller sibling not only because of its 5.5-inch, 1,080 x 1,920 display, but also thanks to the inclusion of two cameras. Both have 12MP sensors; one has a 28mm-equivalent wide-angle f/1.8 lens with optical image stabilsation, and the other camera gets a 56mm-equivalent telephoto lens to effectively provide 2x optical zoom in a smartphone that's just 7.3mm thick.

It's all great on paper, but the image quality is less impressive. Although colour accuracy is first class, phones like the Galaxy S7 and the Google Pixel use slightly larger sensors and resolve much more fine detail. The 7 Plus' low-light quality is another disappointment, and Apple's native camera app is short on manual control and lacks raw capture (although some third-party apps support both). At least it's easy to use, thanks to excellent autofocus and the most accurate image preview here.

OVERALL ★★★½☆

http://madeby.google.com

2 Google Pixel XL

From £719/$770

THE Pixel XL replaces the Nexus 6P as Google's flagship smartphone. Unlike the iPhone 7 Plus, there's just a single rear-facing 12.3MP sensor fronted by an f/2.0 lens, and it lacks proper optical image stablilsation. Google's native camera app is also lacking much manual control, and it won't shoot raw image files.

Thankfully the Pixel's image quality is much more impressive. Its cutting-edge 1/2.3-inch sensor is able to resolve an incredible amount of fine detail, closer to what you'd expect from a 1-inch sensor. Low light performance is equally impressive: even at high ISOs, noise is minimal and detail is well-retained.

The Pixel's white balance, exposure metering and autofocus are also first-class, although the 5.5-inch 1,440 x 2,560 AMOLED screen can slightly oversaturate colours. You won't find a MicroSD slot either, which is a surprising omission given that the Pixel commands serious money.

OVERALL ★★★★½

www.htc.com

3 HTC 10

£570/$700

HTC'S One M9 was a major disappointment in terms of camera quality. Thankfully HTC has ditched its old 20MP sensor, and the new phone packs a more sensible 12MP device paired with a 26mm-equivalent f/1.8 lens that's tricked out with optical image stablisation and laser autofocus. Screen specs are improved, too, as the 10 sports a 5.2-inch 1,440 x 2,560 display, while HTC's camera app is packed with advanced controls including manual focus. You also get a MicroSD slot, and the camera can capture DNG raw files.

The new camera sensor produces a vast improvement in image quality over the One M9. Detail is well-resolved in good light, and the HTC 10's high-ISO image quality is impressive, with minimal noise when the going gets dim. If we were to nitpick, colour and contrast can look a little flat, and the camera app is prone to oversaturating red and orange tones when composing shots.

OVERALL ★★★★☆

FIVE THINGS TO LOOK FOR...

1 EXPANDABLE STORAGE
A Micro SD slot gives you scope to up storage space for snaps and video.

2 PIXEL PERFECT
With resolutions of at least Full HD, all the screens here are crisp enough to hide individual pixels.

3 SCREEN TEST
OLED screens have great contrast, but LCDs can be brighter with better colour accuracy.

4 BUILT TO LAST
Most phones can snap more shots per charge than a compact if you watch your app usage.

5 BIG PICTURE
More megapixels aren't always helpful: image stabilisation and a fast lens are usually more useful.

www.lg.com

4 LG G5

£450/$500

THE G5 has that rarest of features in a modern smartphone: a removable battery. You also get a MicroSD slot for storage expansion, as well as the unusual inclusion of dual rear-facing cameras. The main camera is comprised of a 16MP sensor and 29mm-equivalent, f/1.8 lens, and it's flanked by a secondary 8MP, 12mm-equivalent camera for ultra-wide shooting. Arguably a secondary camera with telephoto capability would be more versatile, though.

This is the only phone here to shoot in a native 16:9 aspect ratio that fills its 5.3-inch screen. The G5's camera app is also well-featured, although it's a pity that Manual mode isn't very intuitive – and yet you'll need it to enable flash control. Other annoyances include poor high-ISO performance, but the G5 gains ground by resolving plenty of detail in good lighting. It can capture stunning dynamic range with HDR enabled.

OVERALL ★★★★½

www.samsung.com

5 Samsung Galaxy S7 Edge

From £639/$770

THE S7's camera app is crammed with features, including raw capture and manual focusing, plus white balance, shutter speed, ISO, autofocus and metering options. There are even three custom modes for storing different set-ups.

Behind the scenes is a 12MP 26mm-equivalent camera with phase-detection autofocus. It doesn't resolve quite as much detail as the Pixel, but the S7's shots look slightly more natural. Low-light performance is superb, helped by the lens' large f/1.7 aperture, effective image stabilisation and a powerful flash. It all helps the S7 steer clear of high ISOs, which is useful as at the maximum ISO 800 sensitivity, noise is rather intrusive.

Other issues include occasional underexposure, while the bevelled edges of the 5.5-inch 1,440 x 2,560 display make the S7 slippery to hold. But these are small gripes with a superb all-rounder.

OVERALL ★★★★★

www.sonymobile.com

6 Sony Xperia XZ

£480/$600

THE Xperia's 23MP camera looks good on paper – but its shots don't. Those extra megapixels actually reduce image quality, as the XZ resolves considerably less detail than its rivals. If fine detail isn't already endangered, noticeable image noise at low sensitivities – combined with overzealous image smoothing by the camera – brings it close to extinction.

It's not all bad news, as Sony's camera app is one of the most feature-packed here. Manual options include white balance and ISO sensitivity, and there are controls for metering and manual focus. You get plenty of fun effects too, like an augmented reality mode, while the 13MP selfie camera takes some beating.

A physical two-stage hardware shutter release and a water-resistant design also go in the XZ's favour, but it's not enough to compensate for the lacklustre image quality from camera tech that's in dire need of an overhaul.

OVERALL ★★½☆☆

LENSES

FIND YOUR NEXT LENS WITH OUR IN-DEPTH REVIEWS

126 **Prime lenses**
9 things you need to know

130 **Wide angle primes**
Manual focus round-up

137 **Laowa 105mm f/2**
Fast telephoto prime lens

138 **Macro lenses**
Get closer to your subjects

145 **Sony FE 50mm f/2.8 Macro**
1:1 full-frame macro prime

146 **Budget telephotos**
More reach, less cost

153 **Sigma 30mm f/1.4**
Fast crop sensor prime

154 **Monster zooms**
Perfect for wildlife and action

161 **Fujifilm XF 100-400mm f/4.5-5.6 R LM OIS WR**
Powerful telephoto for X-mount

Which lens? Expert advice

A CAMERA is just a starting point in photography; a new lens can help you take a big step forward.

There are lots of possibilities to choose from. A fast telephoto zoom lens, for example, is a great investment. It's usually associated with shooting sport and action, but it can also make a great portrait lens, especially for shooting active families.

A macro lens will also let you get much closer to your subject for 1:1 (life-size) replication and dramatic shots. But don't overlook manual focus prime lenses, which usually have large maximum apertures to allow fast shutter speeds: they make great walkabout optics.

130

137

145

161

154

9 THINGS YOU SHOULD KNOW ABOUT USING PRIME LENSES

IT'S ALL ABOUT QUALITY VS VERSATILITY

ZOOM lenses are undeniably great when it comes to convenience and versatility, delivering a range of focal lengths at the flick of a wrist. However, they demand a compromise in terms of outright image quality. With complex arrangements of large groups of lens elements moving back and forth to enable the zoom action, the optical purity suffers.

Sharpness is often the first casualty, and barrel and pin-cushion distortions often appear at the wide-angle and telephoto ends of the zoom range respectively. You can also expect an increase in chromatic aberration (colour fringing around high-contrast edges in a scene) and vignetting. The latter effect is most commonly seen when you're using large apertures at the wide-angle end. Zoom lenses are also often more prone to ghosting and flare.

With a high-quality prime lens, distortion and vignetting should be much less noticeable. Sharpness should also be excellent, so you can really make the most of the latest high-res sensors.

The need for speed

Another big bonus of using prime lenses is that they're usually 'faster'. This means they have a larger maximum aperture, which enables quicker shutter speeds. For example, a typical 18-55mm zoom lens has a maximum aperture of f/3.5 at the wide-angle end, shrinking to a mere f/5.6 at about 50mm. Switch to a 50mm f/1.4 prime lens and the largest aperture is four stops faster.

In low light you'd be limited to a shutter speed of, say, 1/15 sec with a typical zoom (unless you increase your ISO setting). However, an f/1.4 lens will enable a much faster shutter speed of 1/250 sec. An f/1.8 lens is 3.3 stops faster than an f/5.6 lens, and an f/2.8 model is two stops faster.


Nikon
AF-S NIKKOR 28mm 1:1.8
SUPER EBC f=18mm 1:2 Ø52
FUJINON ASPHERICAL LENS
SAMYANG 1.4/24mm
Canon
24mm
AF
MF
CANON LENS EF 24mm 1:1.4

So-called 'faster' lenses aren't just good for avoiding camera-shake and freezing the action in dull lighting conditions. Another big advantage is that you can get a much tighter depth of field, enabling you to isolate the main point of interest in a shot by blurring the background. It's a favourite trick in portraiture, especially when the background is cluttered and would otherwise be a distraction.

It can be tricky to use large apertures in bright, sunny conditions, but you can get round the problem by fitting a neutral density (ND) filter. These often have a fixed value, but it's also possible to get variable NDs, and these are a great option when you're shooting video and want the cinematic, shallow depth of field that's all the rage.

Focal length and sensor size

An important factor to consider when you're buying a prime lens is which focal length to go for. Back in the days of 35mm film, a 50mm prime was considered a 'standard' lens. That's because it gives pretty much the same perspective as viewing a scene with the human eye, without the magnification of a telephoto lens or the shrinkage a wide-angle lens uses to squeeze more into the frame.

With a variety of sensor sizes now available, it's not quite a clear-cut now. If you've got a DSLR with a smaller APS-C sized sensor like a Canon EOS Rebel T6i / 750D or Nikon D3400, things are a little different because of the so-called crop factor applied, with a 35mm lens providing pretty much the same perspective on these cameras as you would get from a 50mm lens on a full-frame DSLR.

With all that in mind, to help you get more from your fixed-focal length optic we've offered up below our 9 points you should know about using prime lenses.

1

They make you work harder

With a zoom lens, it's easy to get lazy and zoom in and out, letting the lens do the hard work for you, but a prime lens makes you think about the shot more, forcing you to be more creative.

2

Bigger is better

The 'fastest' lenses have apertures of f/1.4 or f/1.8 and enable higher shutter speeds and reduced depth of field. This makes them more useful than f/2.8 lenses.

3

Choose your focal length

Before diving in and getting your prime lens, do your research. You may think you need a 24mm prime, but a quick look at the focal lengths you use most in Lightroom or Adobe Bridge might reveal that in actual fact you tend to shoot more at 28 or 35mm.

4

Open wide

When shooting at the maximum aperture with fast f/1.4 lenses, outright sharpness can be a bit lacking in some instances, particularly at the edges of the frame, but this varies from lens to lens.

5

Close quarters

A macro facility adds versatility, but you'll have to be very close to the object you're shooting with a 50mm lens, and a 35mm is almost unusable.

6

Play with light

Invest in a neutral density filter if you want to shoot with large apertures – it will reduce depth of field in sunny conditions.

7

Weight

With few moving parts, prime lenses are more compact and lighter than their zoom siblings – perfect if you want to travel light. That said, some expensive primes with lots of quality glass elements that's matched by a tank-like build quality can be heavy.

8

Sitting pretty

A 50mm lens on an APS-C format body is a great combination for portraiture. A maximum aperture of f/1.4 or f/1.8 enables you to blur the background much more effectively than you'd be able to with a budget 18-55mm zoom lens.

9

Investment banking

If your budget can stretch to it, buy a professional optic, such as a full-frame compatible lens, even if you currently use an APS-C format DSLR – one day you may decide to trade up to a full-frame camera.

MANUAL-FOCUS LENSES

Let's twist again, with fingers firmly on the focus ring. ***Matthew Richards*** *explores the benefits of manual lenses*

WHAT'S so good about autofocus anyway? Those who like being in control often shy away from multi-point AF, where the camera decides which parts of a scene it's going to focus on, often in a seemingly arbitrary process. Instead, they'll single out the central AF point. This invariably means choosing an object in the scene that's our preferred distance away, autofocusing, then maintaining a light press on the shutter button while they swivel the camera and compose the shot.

For landscapes, street photography, reportage and action sports, manual focusing is a viable alternative. These manual lenses have a very particular advantage for manual focusing. They have longer, more accurate focus scales and most have depth of field index markings. With these lenses you can manage depth of field and hyperfocal distances precisely, something you can rarely do with regular autofocus lenses.

Most digital cameras aren't really set up for accurate manual focusing – the split-screen and microprism viewfinder aids of 35mm film cameras are long gone – but help might still be at hand. Some manual lenses have built-in electronics that enable operation of the focus assist and confirmation lamps in the viewfinder.

In some cases, you also need to set the aperture on the lens itself, rather than from the camera. This might sound like an extra chore but there's a lot to be said for setting up your camera and lens, then concentrating fully on what you're shooting, instead of worrying about what the camera's going to do next. And there's nothing more frustrating than missing a defining, magical moment because your camera has suddenly gone AWOL on autofocus duties.

THE CONTENDERS

1	**Irix** 15mm f/2.4 Blackstone	£600/$700
2	**Laowa** 15mm f/4 Wide Angle Macro	£450/$500
3	**Samyang** 10mm f/2.8 ED AS NCS CS	£350/$400
4	**Samyang** 14mm f/2.8 IF ED UMC	£300/$330
5	**Voigtländer** 10.5mm f/0.95 Nokton	£900/$1,100
6	**Zeiss** Loxia 2.8/21mm	£1,100/$1,500
7	**Zeiss** Milvus 2/21mm	£1,300/$1,850
PLUS	**Zeiss** Touit 2.8/12mm	£650/$1,000

Canon EF | Nikon FX | Pentax K

Irix 15mm f/2.4 Blackstone

£600/$700

Welcome to the dark side

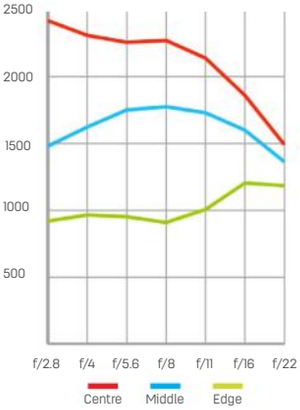
WE RAN a full review of the plastic-bodied Firefly version of this lens last issue. The beefier Blackstone has a magnesium alloy skin, an extra weather-seal at the front and fluorescent engraved markings. The markings include a focus-distance scale and both depth-of-field and hyperfocal-distance markings for f/8, f/11 and f/16. There's even a fine-tuning mechanism for optimum accuracy on individual camera bodies.

As you'd hope for in a manual-focus lens, the focus ring has silky-smooth rotation and a long travel of about 150°, enabling excellent precision. Built-in electronics feed focus assist and confirmation lamps in the viewfinder and allow the aperture to be set from the host camera. This also maintains a bright viewfinder image when stopping down.

Performance

Image quality is excellent in all respects, and exposure control proved more accurate than in the Firefly edition that we reviewed last issue. It's also neat that you can lock the focus setting to any preset position, thanks to a separate locking ring.

SHARPNESS HIGHER IS BETTER



Sharpness is impressive throughout the range, and astonishing wide-open at f/2.4.

FRINGING (AT F/8 LOWER IS BETTER)

Fringing 0.79

There's practically no colour fringing, even around high-contrast edges at the edges.

DISTORTION NEARER 0 IS BETTER

Control over barrel distortion is good, and better than the Samyang and Laowa lenses.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★½
VALUE	★★★★★
OVERALL	★★★★½

Canon EF | Nikon FX | Pentax K | Sony A | Sony E

Laowa 15mm f/4 Wide Angle Macro £450/$500

A shifty lens of hidden talents

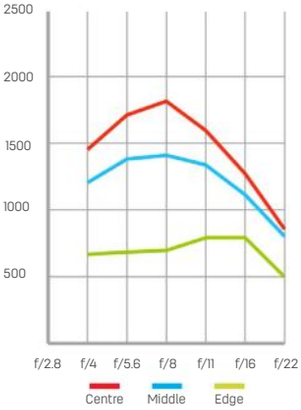
SOMETHING of an oddball, this wide-angle lens delivers full 1.0x macro magnification. It's great for extreme close-ups in which you want to major on a small subject yet include its surroundings. In full macro mode, however, the front of the lens is only about 5mm from the target, which is seldom practical. The lens also includes a 6mm shift mechanism. Its operation is basic, but it enables some perspective correction and an avenue of creative possibility.

There are no built-in electronics, so it's a completely manual lens. The stepless, click-free aperture ring is a bonus for movie capture, but precise focus adjustments are tricky, due to the focus ring only having 90° of travel. This is despite the extended close focusing range for macro shooting.

Performance

Centre sharpness is respectable but images are soft around the edges. Contrast is a little lacking at wide apertures. Distortion isn't too bad in conventional shooting but becomes irregular when using the shift feature, somewhat negating the function's usefulness for architectural shooting.

SHARPNESS HIGHER IS BETTER



Good at the centre, sharpness drops off towards the frame's edges and corners.

FRINGING (AT F/8) LOWER IS BETTER

Fringing 1.68

This does a decent job of keeping colour fringing to low levels across the frame.

DISTORTION NEARER 0 IS BETTER

Barrel distortion lacks uniformity, using the shift function to correct perspective.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★☆☆
VALUE	★★★½☆
OVERALL	★★★½☆

Canon EF-S | Canon M | Fujifilm X | Nikon FX | Pentax K | Samsung NX | Sony A | Sony E | Four Thirds | Micro Four Thirds

Samyang 10mm f/2.8 ED AS NCS CS £350/$400

A budget ultra-wide for crop sensors

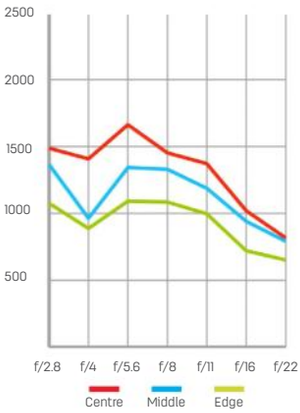
DESIGNED exclusively for crop-sensor cameras in a wide range of mount options, this Samyang gives a similarly wide viewing angle on APS-C bodies as a 15mm lens on a full-frame body. Despite not being full-frame compatible, it's much bigger than the Laowa 15mm lens, mostly due to its faster aperture rating which requires a larger-diameter front element.

The Nikon-fit edition includes electronics that enable camera-driven aperture control and the illumination of focus-assist lamps in the viewfinder. These are lacking in other mount options of the lens. The lens hood forms an integral part of the barrel and can't be removed, precluding the attachment of filters. Build quality feels good, and the focus ring has a fluid feel to its 140° rotation.

Performance

There's remarkably little drop-off in sharpness across the frame when shooting wide-open, but vignetting is severe and much more noticeable than in Samyang's 14mm full-frame lens. The high-tech nano-structure coatings do well to fend off ghosting and flare.

SHARPNESS HIGHER IS BETTER



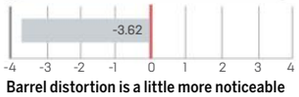
Remarkably good wide-open, sharpness is actually better at f/2.8 than it is at f/4.

FRINGING (AT F/8) LOWER IS BETTER

Fringing 1.61

Colour fringing worsens at narrow apertures but remains within respectable limits.

DISTORTION NEARER 0 IS BETTER



Barrel distortion is a little more noticeable than from other lenses in the test group.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★★☆
VALUE	★★★★½
OVERALL	★★★★½

Canon EF-S | Canon M | Fujifilm X | Nikon FX | Pentax K | Samsung NX | Sony A | Sony E | Four Thirds | Micro Four Thirds

Samyang 14mm f/2.8 IF ED UMC £300/$330

Quite compact for a full-frame optic

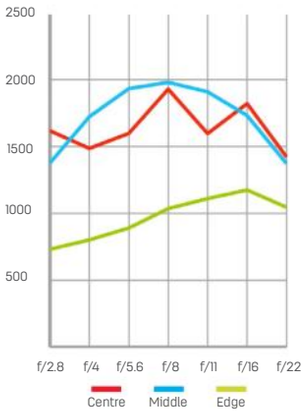
COMPATIBLE with full-frame cameras, the Samyang 14mm has the same f/2.8 aperture rating as its 10mm sibling for crop-sensor bodies. It's slightly smaller and lighter than the 10mm lens. Again, the Nikon-fit edition adds electronics and a small price increase, but it's manual all the way with the Canon-fit version that we tested, so the viewfinder image gets darker as you narrow the aperture.

The downsized design is enabled by the inclusion of both hybrid and regular aspherical elements, instead of two regular aspherical elements. Other optical upgrades include an extra ED (Extra-low Dispersion) element and three HRI (High Refractive Index) elements. Both have a six-blade diaphragm and built-in hood, but the 14mm is the only lens here to lack depth of field markings.

Performance

Focusing precision benefits from the control ring having a much longer travel than in the Samyang 10mm lens, at 240° compared with 140°. Image quality is very similar from both lenses. The 14mm's corner-sharpness drops off more, but vignetting is less noticeable.

SHARPNESS HIGHER IS BETTER



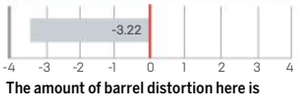
Centre sharpness is very good at the widest aperture, but drops away in the corners.

FRINGING (AT F/8) LOWER IS BETTER

Fringing 1.15

Opposite to its 10mm stablemate, colour fringing decreases as the aperture narrows.

DISTORTION NEARER 0 IS BETTER



The amount of barrel distortion here is just a little less than from the 10mm lens.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★★½
OVERALL	★★★★½

Micro Four Thirds

Voigtländer 10.5mm f/0.95 Nokton £900/$1,100

It can practically see in the dark

MORE than three full f/stops faster than an f/2.8 lens, the Voigtländer is reasonably small and light, while giving an effective focal length of 21mm on Micro Four Thirds cameras. It's a manual affair, but that's easier to live with on a mirrorless camera than an SLR.

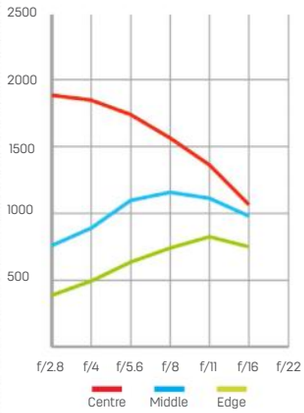
The electronic viewfinder (rear screen) remains bright when you narrow the aperture, giving an indication of the actual exposure. Shooting was natural in Aperture Priority and metered manual modes on our MFT test bodies.

Quick and easy selection of click-steps or click-free aperture control is available via an additional control ring on the barrel. The focus ring has a very smooth action and an extra-long 265° of travel, while depth-of-field markings are shown for most apertures between f/1.4 and f/11.

Performance

Corner sharpness is disappointing, especially at apertures wider than f/4, but centre sharpness and contrast are good. Vignetting is minimal considering the ultra-wide aperture rating and, overall, the lens is a strong performer.

SHARPNESS HIGHER IS BETTER



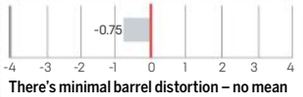
At wide aperture settings, corner-sharpness figures are much lower than you'd expect.

FRINGING (AT F/8) LOWER IS BETTER

Fringing 2.69

Colour fringing remains constant, but can be noticeable towards the frame's edges.

DISTORTION NEARER 0 IS BETTER



There's minimal barrel distortion – no mean feat for a lens with such short focal length.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★☆
VALUE	★★★★☆
OVERALL	★★★★☆

Sony E

Zeiss Loxia 2.8/21mm £1,100/$1,500

Sony shooters get the best deal

COMPACT but beautifully engineered, Zeiss Loxia lenses are designed exclusively for Sony Alpha 7 full-frame cameras. This is the widest-angle offering in the range, with 35mm, 50mm and 85mm lenses also being available.

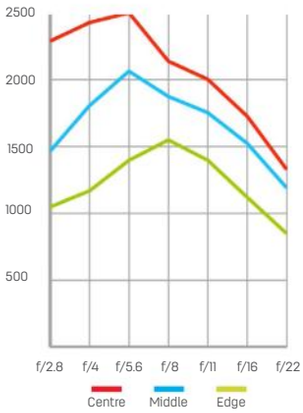
Not to be confused with Zeiss-badged Sony lenses, this is more traditional, manual-focus Zeiss fare. Travel in the focus ring is only about 90° but still enables very precise adjustments, aided by an automatic magnified preview while you're focusing, courtesy of the A7's 'MF Assist' function.

The aperture ring has one-third f/stop click steps, but also has a de-click option for step-less aperture control. Mode selection requires the turn of a screw in the mounting plate, so you have to remove the lens from the camera.

Performance

Benefiting from classic Zeiss Distagon design values, the Loxia delivers spectacular image quality and sublime handling in a package that's a perfect match for A7-series cameras. Our only quibble is that vignetting is pronounced at f/2.8, but it's much reduced at f/4.

SHARPNESS HIGHER IS BETTER



The Loxia's superb sharpness does justice to high-resolution cameras like the A7R II.

FRINGING (AT F/8) LOWER IS BETTER

Fringing 0.59

Colour fringing is practically impossible to spot anywhere in the image frame.

DISTORTION NEARER 0 IS BETTER

Almost matching the perfect score of the Milvus, this is essentially distortion-free.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

Canon EF-S | Nikon FX

Zeiss Milvus 2/21mm

£1,300/$1,850

The Milvus range is growing up strong

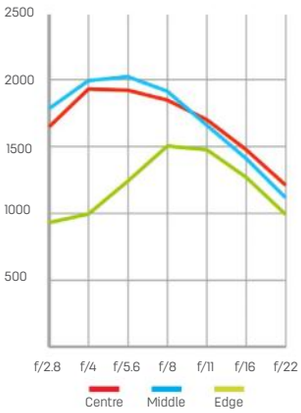
THE range of Milvus lenses for Canon and Nikon SLRs is nine strong, ranging from 15mm to 135mm in focal length, and including two 0.5x macro lenses. Optics include updated versions of classic Zeiss Distagon and Planar designs, this 21mm f/2 lens exemplifying the former. It features the same excellent build quality as the Loxia but is much larger and about twice the weight – partly because it's for SLRs but also as it's an f/stop faster.

The travel of the focus ring is increased to 125°, enabling precise adjustments. Electronics enable the illumination of focus-assist and confirmation lamps in the camera's viewfinder. The Nikon-mount option has an aperture ring with the same de-click mechanism as in the Loxia lens.

Performance

Typical of the Zeiss Milvus range, the 21mm delivers exceptional sharpness and contrast, even at its widest aperture. It's a stunning lens that does full justice to the highest-resolution Canon and Nikon SLRs. As with the Loxia though, vignetting is severe at apertures wider than f/4.

SHARPNESS HIGHER IS BETTER



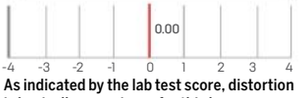
Levels of sharpness are good and consistent throughout the entire aperture range.

FRINGING (AT F/8) LOWER IS BETTER

Fringing 1.05

There's practically no colour fringing, even in the extreme corners of full-frame images.

DISTORTION NEARER 0 IS BETTER



As indicated by the lab test score, distortion is basically a non-issue for this lens.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

ALTERNATIVE CHOICE

Zeiss Touit 2.8/12mm

£650/$1,000

The pros and cons of autofocus

SUCH is the prevalence of modern autofocus lenses that it's hard to find manual alternatives for some camera systems. One option is to go for a premium wide-angle prime like the Zeiss Touit, which is an autofocus lens but boasts the heritage of classic Zeiss Distagon design.

Available in Fujifilm X and Sony E-mount options, this APS-C format lens is still a good choice for manual shooting. Like various other stepping-motor autofocus lenses, the electronic fly-by-wire focus ring enables fine and precise adjustments in manual focusing.

While the Touit lacks a focus distance scale and depth of field markings, many mirrorless cameras can display focus distance information in the viewfinder.

Judging the depth

Mirrorless cameras give you a live preview of the depth of field at any combination of focus distance and aperture, while keeping a viewfinder or LCD image that reflects the exposure setting. It can be more convenient than pressing the DOF Preview button on a SLR, only to get a dark viewfinder image.

PROS

- The option of autofocus whenever you want it.
- For critical focusing with longer focal lengths and reduced depths of field, autofocus can be faster.
- Full-time manual override is often available in autofocus lenses, enabling seamless swapping.

CONS

- Fine manual adjustment can be difficult in autofocus lenses, as the focus ring's rotational travel is often small.
- Modern autofocus lenses often lack a distance scale and depth-of-field markings.
- The focus rings in autofocus lenses often lack the smooth feel of a manual lens.

THE VERDICT

It's a Zeiss win

The Zeiss Loxia 2.8/21mm comes up trumps

THE little Loxia packs a mighty punch in terms of sharpness and contrast, while reining in colour fringing and distortion to excellent effect. Image quality is spectacular, handling is sublime and build quality is solid. For manual shooting, Loxia lenses with a Sony A7-series cameras make a dream team.

For the same excellence in build, handling and image qualities on a D-SLR, the Zeiss Milvus takes top spot. However, the Irix Blackstone runs a very close second to the Milvus, adding some clever tricks and design flourishes, while also being cheaper.

Both of the Samyangs have refined handling characteristics, and deliver pleasing image quality at competitive prices. They are available in a wide variety of mount options to suit most SLRs and mirrorless cameras.

The Voigtländer works very well as a Micro Four Thirds lens. Its super-fast f/0.95 aperture not only extends your stills and movie shooting possibilities in low light, but also enables a tight depth of field in wide-angle shooting.

The Laowa lens combines ultra-wide shooting with full 1.0x macro magnification, and even a shift mechanism for correcting perspective.

HOW THE LENSES COMPARE







	Irix 15mm f/2.4 Blackstone	Laowa 15mm f/4 Wide Angle Macro	Samyang 10mm f/2.8 ED AS NCS CS	Samyang 14mm f/2.8 IF ED UMC	Voigtländer 10.5mm f/0.95 Nokton	Zeiss Loxia 2.8/21mm	Zeiss Milvus 2/21mm
Contact	www.irixlens.com	www.venuslens.net	www.samyanglensglobal.com		www.voigtlaender.com	www.zeiss.com	
Street price	£600/$700	£450/$500	£350/$400	£300/$330	£900/$1,100	£1,100/$1,500	£1,300/$1,850
Mount options	EF FX K	EF FX K A E	EF-S M X DX K NX A E FT MFT	EF-S M X DX K NX A E FT MFT	MFT	E	EF F
Image circle	Full-frame	Full-frame	APS-C	Full-frame	MFT	Full-frame	Full-frame
Angle of view	110 degrees	110 degrees	110 degrees	116 degrees	93 degrees	91 degrees	90 degrees
Elements/ groups	15 / 11	12 / 9	14 / 9	14 / 10	13 / 10	11 / 9	16 / 13
Diaphragm blades	9 blades	14 blades	6 blades	6 blades	10 blades	10 blades	9 blades
Aperture ring	No	Yes	Yes	Yes	Yes	Yes	Nikon only
Aperture control from camera	Yes	No	Nikon only	Nikon only	No	No	Yes
Aperture range	f/2.4-22	f/4-32	f/2.8-22	f/2.8-22	f/0.95 to f/16	f/2.8-22	f/2.8-22
DOF markings	f/8, 11, 16	f/5.6, 11, 16, 22	f/2.8, 4, 5.6	None	f/1.4, 2, 4, 8, 11	f/4, 8, 16, 22	f/4, 8, 16, 22
Minimum focus distance	0.28m	0.12m	0.24m	0.28m	0.17m	0.25m	0.22m
Focus ring travel	150 degrees	90 degrees	140 degrees	240 degrees	265 degrees	90 degrees	125 degrees
Filter size	95mm	77mm	N/A	N/A	72mm	52mm	82mm
Hood	Petal, supplied	Petal, supplied	Built-in	Built-in	Petal, supplied	Petal, supplied	Petal, supplied
Widest diameter x length	114 x 100mm	84 x 65mm	87 x 104-132mm*	87 x 96-122mm*	77 x 82mm	62 x 72mm	96 x 110-112mm*
Weight	653-685g	410g	580-625g	530-575g	585g	394g	735-851g

*Length varies with mount option

FEATURES	★★★★★	★★★★½	★★★½☆	★★★½☆	★★★★½	★★★★★	★★★★★
BUILD & HANDLING	★★★★★	★★★★☆	★★★½☆	★★★★☆	★★★★½	★★★★★	★★★★★
PERFORMANCE	★★★★½	★★★☆☆	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★★
VALUE	★★★★★	★★★½☆	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★½
OVERALL	★★★★½	★★★½☆	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★★

TELEPHOTO PRIME LENS www.venuslens.net

Laowa 105mm f/2 STF

£735/$700

This lens goes further than most to create lush bokeh

PHOTOGRAPHERS can be a fussy lot, demanding sharp lenses that also deliver very smooth bokeh (the quality of defocused areas within images). The conventional route is to use a fast lens with a wide aperture, enabling a small depth of field.

This new Laowa Soft Trans Focus lens from Venus Optics employs an apodisation element in an effort to take bokeh to a creamier, dreamier level. It's essentially a built-in radial graduated neutral-density filter that reduces light transmission towards the perimeter of the frame. It's like having a secondary, smoothly graduated iris that works in conjunction with the main aperture (actually two apertures, as we'll see later) to produce a softer bokeh.

Build & handling

The Chinese-made lens feels solid and sturdy, with its metal barrel and mounting plate. Our only criticism is that the electronic connectors in our Canon-fit review sample looked a bit rough and ready. The lens is also available in Nikon and Sony E mount options, with Sony A and Pentax editions due imminently.

There are two aperture rings. One adjusts a diaphragm with a nominal eight blades (we counted 13!) in full f/stop increments between f/2 and f/22 for stills photography. The other is for shooting video and controls a well-rounded 14-blade diaphragm with continuous step-less adjustment between T3.2 and T8. In both cases, the aperture has to be set using the relevant aperture ring, and can't be controlled from the camera body.

Performance

The focus ring operates with excellent smoothness and precision. True to its aims and claims, the lens delivers gorgeous bokeh with fabulous smoothness, but the levels of sharpness from the centre to the extreme edges of the frame are also impressive.

Matthew Richards

1 11 optical elements are configured in eight groups, and include one extra-refractive element, three low-dispersion elements and an apodisation element.

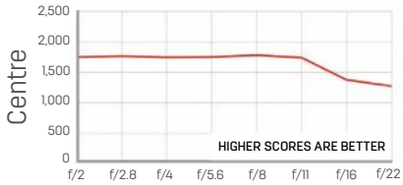
2 The long-travel focus ring operates very smoothly and enables excellent focusing precision. Depth of field markings are shown for f/5.6, f/11 and f/22.

3 The main aperture ring operates in full f/stop click-steps between f/2 and f/22, whereas the video-friendly clickless aperture ring ranges from T3.2 to T8.

SPECIFICATIONS

Full-frame compatible _ Yes
Effective focal length _ 157.5-168mm (APS-C)
Image Stabiliser _ No
Minimum focus distance _ 0.9m
Max magnification factor _ 0.16x
Manual focus override _ N/A
Focus limit switch _ No
Internal focus _ Yes
Filter size _ 67mm
Iris blades _ 8 (F) 14 (T)
Weather seals _ No
Supplied accessories _ Hood
Dimensions (dia x length) _ 76 x 99mm
Weight _ 745g

SHARPNESS



Sharpness across the frame is very good and consistent through the aperture range.

FRINGING NEARER 0 IS BETTER

f/2 0.92 **f/8** 0.63 **f/22** 0.54

Lateral chromatic aberration is negligible and longitudinal is well controlled.

DISTORTION NEARER 0 IS BETTER

There's really no visible distortion in any of the images taken with this lens.

WE SAY...

It's a hands-on lens with manual focusing and aperture control, but the Laowa combines excellent sharpness with superb softness.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★☆
IMAGE QUALITY	★★★★½
VALUE	★★★★☆
OVERALL	★★★★☆

MACRO LENSES

It's all in the detail. ***Matthew Richards*** *tests eight close-up options*

THERE'S big news in the small world of photographing tiny objects. A redesign of Tamron's 90mm lens is aiming for new heights of excellence, while a price drop in Sigma's 105mm lens makes it look great value for money, especially in the UK. Samyang puts its own twist on macro photography with its manual lens, while Tokina sticks to a veteran design. So how do all these independently manufactured lenses stack up against own-brand competition?

The Canon 100mm L-series and Nikon's 105mm represent both companies' most high-tech macro optics. While they're costly, Sony's new E-mount 90mm has an even heftier price tag. The Micro Four Thirds 60mm lens is Olympus's finest offering, but is much more affordable. Let's take a look...

THE CONTENDERS

1 **Canon** EF 100mm f/2.8L Macro IS USM £870/$800
2 **Nikon** AF-S 105mm f/2.8G IF ED VR Micro £750/$900
3 **Olympus** 60mm f/2.8 Macro M.Zuiko Digital ED £370/$500
4 **Samyang** 100mm f/2.8 ED UMC Macro £350/$530
5 **Sigma** Macro 105mm f/2.8 EX DG OS HSM £320/$620
6 **Sony** FE 90mm f/2.8 Macro G OSS £900/$1,100
7 **Tamron** SP 90mm f/2.8 Di VC USD Macro £580/$650
8 **Tokina** AT-X AF 100mm f/2.8 Pro D £350/$370

iko / Shutterstock

Mount option: Canon EF

Canon EF 100mm f/2.8L Macro IS USM

£870/$800

It's a high-tech affair

WHILE several of the latest macro lenses feature an optical stabiliser, the one that was developed specifically for this lens is a hybrid system. It can counteract axial shift (up-down and side-to-side movement) as well as the usual angular vibration, or wobble. Other highlights include ring-type ultrasonic autofocus, with the usual full-time manual override, and a three-position autofocus limiter switch that can lock out either the short or long end of the range.

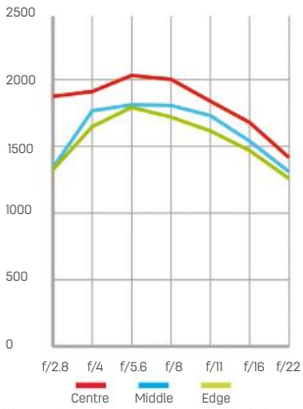
The pro-grade build includes weather-seals and the lens comes with a hood and soft pouch. A UD (Ultra-low Dispersion) element is included in the optical path to boost sharpness and contrast while reducing chromatic aberrations.

Performance

Autofocus is fast and accurate and, arguably more importantly for macro shooting, the manual focus ring operates smoothly and enables precise adjustments.

The hybrid stabiliser works well for regular and fairly close-up shooting, but is of little benefit at the closest focus distance for maximum macro magnification.

SHARPNESS HIGHER IS BETTER



It's excellent across the frame, but bokeh isn't as smooth as with the Sony or Tamron.

FRINGING LOWER IS BETTER

f/2.8 1.35 **f/8** 0.74 **f/16** 0.72

The worsening at f/2.8 is of no concern for close-ups with narrower apertures.

DISTORTION NEARER 0 IS BETTER

There's more barrel distortion than with any other lens on test, but it's still minimal.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★☆
VALUE	★★★½☆
OVERALL	★★★★½

Mount option: Nikon FX

Nikon AF-S 105mm f/2.8G IF ED VR Micro

£750/$900

Nikon's most impressive macro lens

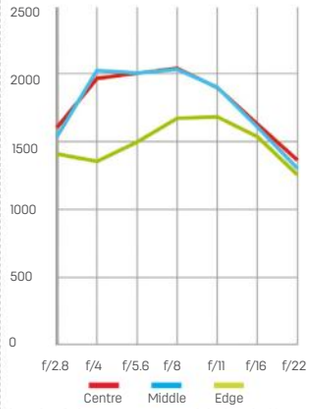
NIKON currently markets several of what it calls 'Micro' lenses, including two DX models that are specifically designed for use on APS-C format cameras. The 105mm VR has the most advanced features and specifications, and a comfortable working distance enabled by its focal length.

This was the world's first macro lens to include an optical stabiliser, although it's not a hybrid system. The upmarket build includes a weather-sealed mount, an ED (Extra-low Dispersion) optical element, Nano Crystal coating to reduce ghosting and flare, and fast ring-type ultrasonic autofocus. There's an autofocus range limiter switch but, disappointingly, it's not able to lock out the long range for close-up shooting.

Performance

Autofocus and VR (Vibration Reduction) work well for general shooting but are of no real benefit for extreme close-ups. Manual focusing is more precise than in other recent Nikon 'G-type' macro lenses and the image quality is very good overall, but the lens isn't great value at this price.

SHARPNESS HIGHER IS BETTER



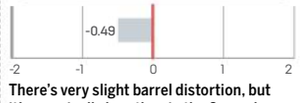
Levels of sharpness are good, but no better than in some of the cheaper competitors.

FRINGING LOWER IS BETTER

f/2.8 1.92 **f/8** 2.26 **f/16** 2.31

It's not generally noticeable, but lab scores for this lens are the worst in the group.

DISTORTION NEARER 0 IS BETTER



There's very slight barrel distortion, but it's marginally less than in the Canon lens.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★½
VALUE	★★★½☆
OVERALL	★★★★½

Mount option: Micro Four Thirds

Olympus 60mm f/2.8 Macro M.Zuiko Digital ED

£370/$500

You'll be seeing double

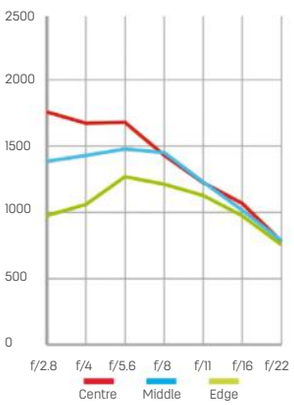
COMPARED with other manufacturers' own-brand macro lenses on test, the Olympus is very affordable. Designed for the Micro Four Thirds format, which requires a relatively small image circle, the lens is compact and remarkably light, at just 185g. Even so, it feels sturdy and well-built, and the construction includes weather seals.

The MFT format's 2.0x crop factor gives the lens an effective focal length of 120mm. More importantly for macro shooting, this also doubles the 'effective' maximum magnification to 2.0x, when using the lens at its 20cm minimum focus distance. The only catch is that this distance is closer than normal, increasing the risk of casting a shadow over your subject.

Performance

Both automatic and manual focusing work very effectively for macro shooting, based on a stepping motor system that enables excellent precision. Image quality is very pleasing overall, and the Zero coatings offer good resistance against ghosting and flare. It's simply the best macro lens choice for MFT cameras.

SHARPNESS HIGHER IS BETTER



Scores for sharpness don't look impressive, but images retain excellent fine detail.

FRINGING LOWER IS BETTER

f/2.8 0.12 f/8 0.7 f/16 0.8

There's very little colour fringing at any aperture throughout the entire range.

DISTORTION NEARER 0 IS BETTER

The amount of pincushion distortion is so negligible that it's almost impossible to spot.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★★☆
OVERALL	★★★★½

Mount option: Canon EF | Fujifilm X | Nikon FX | Pentax K | Samsung NX | Sony A | Sony E | Four Thirds | Micro Four Thirds

Samyang 100mm f/2.8 ED UMC Macro

£350/$530

A macro lens for almost any camera

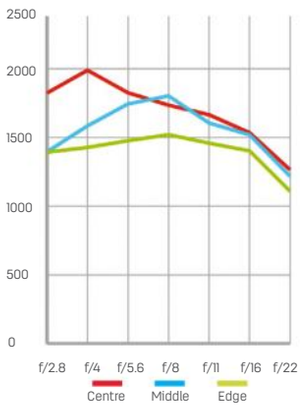
AVAILABLE in a barrage of different mount options, including the likes of Micro Four Thirds, Samsung NX and both Sony A and E fits, the Samyang is a very manual affair. Not only does it lack any autofocus ability, but the aperture also has to be set manually, using the lens's aperture ring. The only exception to this is the Nikon-fit edition, which includes the electronics and mechanics necessary for adjusting the aperture from the host camera.

The lens is well engineered and handles beautifully. The focus ring has a long travel and is silky smooth in operation, enabling excellent precision for very fine adjustments. High-quality optical elements include both ED (Extra-low Dispersion) and HR (High Refractive) glass.

Performance

Sharpness and contrast are good even at the widest available aperture of f/2.8, and remain very consistent throughout most of the aperture range. A problem when using narrow apertures for non-Nikon SLRs is that the viewfinder image becomes very dark indeed.

SHARPNESS HIGHER IS BETTER



Sharpness is good across the whole frame, but not altogether outstanding.

FRINGING LOWER IS BETTER

f/2.8 0.51 f/8 1.74 f/16 1.56

It's a little worse than average, especially at mid-range apertures, but no real issue.

DISTORTION NEARER 0 IS BETTER

There's a touch of pincushion distortion, but not usually enough to detect.

VERDICT

FEATURES	★★½☆☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★☆☆
OVERALL	★★★½☆

Mount options: Canon EF | Nikon FX | Sony A | Sigma SA

Sigma Macro 105mm f/2.8 EX DG OS HSM

£320/$620

High-end performance at a low price

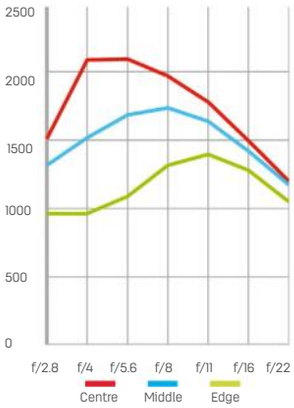
THIS full-frame compatible macro lens is available in Canon, Nikon and Sony A mount options. It's the outright cheapest lens here (in the UK, at least) but you'd never guess based on the feature set. The Sigma boasts ring-type ultrasonic autofocus with a three-position range limiter switch, optical stabilisation with dual static and panning modes, and two SLD (Special Low Dispersion) optical elements. It's supplied with a soft case, a hood and a hood converter to optimise efficiency when using the lens on an APS-C format camera.

Build quality is good and the construction feels sturdy and solid, while operation of the manual focus ring is smooth and precise. The only slight drawback is that the Sigma has no weather seals.

Performance

The Sigma combines excellent image quality with accurate autofocus and effective stabilisation, which match the pricier Nikon. Being a standard rather than hybrid stabiliser, it loses out to the Canon and Tamron for close-range effectiveness, but the Sigma is unbeatable value.

SHARPNESS HIGHER IS BETTER



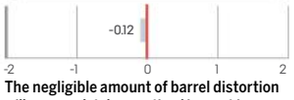
The drop in extreme corner-sharpness isn't a concern for the majority of macro shooting.

FRINGING LOWER IS BETTER

f/2.8 0.56 **f/8** 0.79 **f/16** 0.76

Colour fringing isn't really perceptible, even towards the extreme corners.

DISTORTION NEARER 0 IS BETTER



The negligible amount of barrel distortion will go completely unnoticed in most images.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★½
VALUE	★★★★★
OVERALL	★★★★½

Mount options: Sony E

Sony FE 90mm f/2.8 Macro G OSS

£900/$1,100

An E-mount lens with all mod-cons

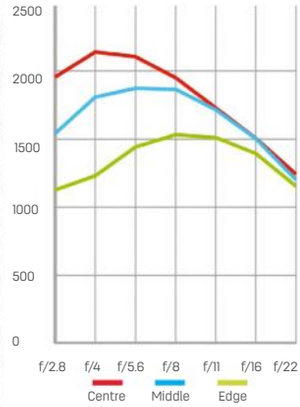
ONE of Sony's G-series lenses for E-mount cameras, this 90mm macro is designed to deliver beautiful bokeh. Other features include a DDSSM (Direct Drive Super Sonic wave Motor) autofocus motor and a three-position range limiter switch. There's even a focus hold button, which is of no practical use for macro photography but can come in handy for portraiture and other short telephoto applications. As with the Tokina lens, the focus ring has a push-pull mechanism for switching between auto and manual focus.

The inclusion of an optical stabiliser is a bonus when using the lens with first-generation A7 cameras, which lack a built-in sensor-shift stabiliser. The high-grade, weather-sealed build hosts an optical path that includes both an ED (Extra-low Dispersion) element and a Super ED element.

Performance

Image quality, handling and overall performance are excellent, but no better than from the much less expensive Tamron lens on test. Ultimately, the Sony is a great lens, but seems relatively poor value for money at the price.

SHARPNESS HIGHER IS BETTER



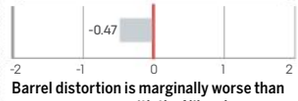
Corner-sharpness could be a little better, but defocused areas are super-soft.

FRINGING LOWER IS BETTER

f/2.8 0.29 **f/8** 0.4 **f/16** 0.76

The Sony suppresses longitudinal and lateral chromatic aberrations very well.

DISTORTION NEARER 0 IS BETTER



Barrel distortion is marginally worse than average, on a par with the Nikon lens.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★☆☆
OVERALL	★★★★½

Mount options: Canon EF Nikon FX Sony A

Tamron SP 90mm f/2.8 Di VC USD Macro

£580/$650

Redesigned, revamped and remarkable

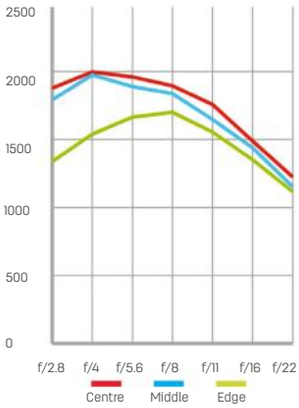
TAMRON has developed something of a history in manufacturing popular 90mm macro lenses. This new edition is the second to feature VC (Vibration Compensation) optical stabilisation and USD (Ultrasonic Drive) autofocus but, while it bears the same string of letters as its predecessor, it's a completely new design. As with the Canon lens on test, the new stabiliser is a hybrid system that compensates for axial shift as well as vibration.

The optics are engineered to enhance the quality of bokeh. The design incorporates one LD (Low Dispersion) and two XLD (eXtra Low Dispersion), along with dual nano-structure coatings to reduce ghosting and flare, plus a moisture-repellent fluorine coating on the front element. All of these facets represent enhancements over the previous Tamron 90mm lens.

Performance

The ring-type ultrasonic autofocus system is optimised for macro shooting but is fast and accurate at any distance, complete with a three-position range limiter. Image quality is stunning, with superb contrast and sharpness.

SHARPNESS HIGHER IS BETTER



In our real-world tests, the Tamron maintained astonishing sharpness in extreme close-ups.

FRINGING LOWER IS BETTER

f/2.8 0.09 **f/8** 1.36 **f/16** 2.06

Edging ahead of the Nikon lens, colour fringing is barely ever perceptible in images.

DISTORTION NEARER 0 IS BETTER

There's no distortion from this lens, with a lab score that's close to perfection.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

Mount options: Canon EF Nikon FX

Tokina AT-X AF 100mm f/2.8 Pro D

£370/$410

An old-school but well-built lens

USING a relatively old design, the Tokina lacks mod cons like optical stabilisation. The Canon-fit edition only has a basic electric autofocus motor, and there's no AF motor at all in the Nikon-fit version. This means that autofocus is impossible with bodies like the D3300 and D5500, which lack in-camera AF drive motors.

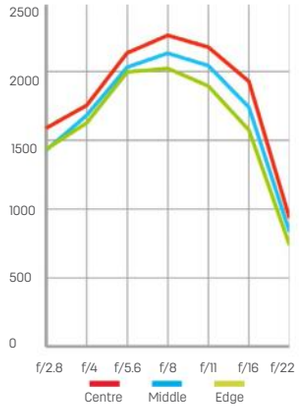
This lens lacks internal focusing, so the inner barrel extends as you focus at closer distances. Even so, it's physically quite small and the distance between the front of the lens and the subject is a fairly typical 13.5cm in full 1.0x magnification shooting.

The Tokina is well-engineered, with a high-quality feel to its handling. The push-pull focus ring enables easy switching between automatic and manual focusing. There's plenty of travel and smoothness in the focus ring's operation, giving great precision.

Performance

Where available, autofocus is a bit slow and clearly audible. Image quality is very good, although the otherwise excellent sharpness levels drop at f/22, a desirable aperture for macro shooting.

SHARPNESS HIGHER IS BETTER



It's excellent across the frame, apart from a drop-off at the narrowest f/22 aperture.

FRINGING LOWER IS BETTER

f/2.8 0.62 **f/8** 0.38 **f/16** 0.35

There's impressively little colour fringing at any aperture, throughout the whole range.

DISTORTION NEARER 0 IS BETTER

With no distortion, the Tokina has a practically perfect lab score in this respect.

VERDICT

FEATURES	★★★☆☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★½☆
OVERALL	★★★½☆

THE VERDICT

Tamron comes out on top

The Tamron SP 90mm F/2.8 Di VC USD Macro is a real beauty

TAMRON'S new incarnation of its classic 90mm macro lens delivers sublime image quality, is beautifully built, and boasts high-end features. The own-brand Canon lens isn't as sharp for extreme close-ups, and the Nikon's overall performance is less impressive.

The Sony lens is a close match to the Tamron in terms of image quality, but has a more standard optical stabiliser. The Sony lens is very pricey, but the Tamron isn't available in a Sony E-mount option, although an A-mount version without stabilisation is in the pipeline.

The Sigma lens is nearly the same price as the Tamron in the USA, but is much cheaper in the UK, and very good value. It's another excellent performer that works brilliantly as a short telephoto prime as well as for extreme close-ups.

For Micro Four Thirds cameras, the Olympus 60mm is the best buy. It's light in weight but nicely built, and makes the most of the MFT format's ability to double the effective magnification. The Samyang delivers good quality if you don't mind being limited to manual focusing. The Tokina also produces good image quality from a more retro design.

HOW THE LENSES COMPARE	Canon EF 100mm f/2.8L Macro IS USM	Nikon AF-S 105mm f/2.8 G IF ED VR Micro	Olympus 60mm f/2.8 Macro M.Zuiko Digital ED	Samyang 100mm f/2.8 ED UMC Macro	Sigma Macro 105mm f/2.8 EX DG OS HSM	Sony FE 90mm f/2.8 Macro G OSS	Tamron SP 90mm F/2.8 Di VC USD Macro	Tokina AT-X AF 100mm f/2.8 Pro D
Contact	canon.co.uk	nikon.co.uk	olympus.co.uk	samyanglens global.com	sigma-imaging-uk.com	sony.co.uk	tamron.co.uk	tokinalens.com
Street price	£870/$800	£750/$900	£370/$500	£350/$530	£320/$620	£900/$1,100	£580/$650	£350/$370
Mount options	EF	FX	MFT	EF X FX K NX A E FT MFT	EF FX A SA	E	EF FX A	EF FX
Full-frame compatible	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Elements/Groups	15/12	14/12	13/10	15/12	16/11	15/11	14/11	9/8
Diaphragm blades	9 blades	9 blades	7 blades	9 blades	9 blades	9 blades	9 blades	9 blades
Autofocus type	Ultrasonic (ring-type)	Ultrasonic (ring-type)	Stepping motor	Manual focus only	Ultrasonic (ring-type)	Ultrasonic (motor)	Ultrasonic (ring-type)	Electric motor (Canon only)
Manual AF override	Full-time	Full-time	Via camera menu	N/A	Full-time	Push-pull	Full-time	Push-pull
Min focus distance	0.3m	0.31m	0.19m	0.31m	0.31m	0.28m	0.3m	0.3m
Internal focusing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Minimum aperture	f/32	f/32	f/22	f/32	f/22	f/22	f/32	f/32
Optical stabiliser	Yes	Yes	No	No	Yes	Yes	Yes	No
Filter size	67mm	62mm	46mm	67mm	62mm	62mm	62mm	55mm
Included accessories	Hood, pouch	Hood, pouch	None	Hood	Hood, hood adaptor, soft case	Hood	Hood	Hood
Dimensions (D x L)	78 x 123mm	83 x 116mm	56 x 82mm	73 x 121mm	78 x 126mm	79 x 131mm	79 x 117mm	74 x 95mm
Weight	625g	750g	185g	705g	725g	602g	610g	540g
FEATURES	★★★★½	★★★★½	★★★★☆	★★½☆☆	★★★★½	★★★★½	★★★★★	★★★☆☆
BUILD & HANDLING	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★½	★★★★★	★★★★☆
PERFORMANCE	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★½	★★★★½	★★★★★	★★★★☆
VALUE	★★★½☆	★★★☆☆	★★★★☆	★★★☆☆	★★★★★	★★★☆☆	★★★★½	★★★½☆
OVERALL	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★½	★★★★½	★★★★★	★★★★☆

MACRO PRIME LENS www.sony.co.uk

Sony FE 50mm f/2.8 Macro £500/$500

A standard prime that fully lives up to its macro billing

THERE have been 50mm 'macro' lenses from the likes of Canon and Zeiss that, while giving a natural perspective with a full-frame SLR, don't deliver the full macro benefit. Instead they only offer a maximum magnification ratio of 0.5x at their closest focus distances.

Like Sony's older A-mount 50mm macro, this new E-mount optic boasts 1.0x magnification, reproducing small objects at full life-size on the image sensor.

Build & handling

Although the lens is compact and light, it feels well-built and fairly robust. It lacks a weather-sealed mount but is dust- and moisture-resistant. The inner barrel doesn't rotate during focusing but does extend at shorter focusing distances, revealing calibrated markings for focus distance and magnification. No lens hood is supplied, but the front element is deeply recessed within the inner barrel, helping to guard against ghosting and flare.

Unusually for a relatively short-focal-length macro lens, there's a focus limiter switch that can lock out the short or long ends of autofocus travel. There's also a handy focus-hold button.

Manual focusing is usually preferable in macro photography, so the smooth-action, fly-by-wire manual focusing system is a bonus. It offers excellent precision with the availability of fine adjustments, aided by the magnified focusing view available in Sony compact system cameras.

Performance

The autofocus system is highly accurate but rather slow. For close-up shots, AF speed can be further hampered by hunting, so the limiter switch earns its keep. Wide-open at f/2.8, there's a little vignetting and a slight drop in sharpness, but the quality of bokeh is pleasing.

Sharpness is excellent from f/4 to f/11, but macro photographers might be disappointed that it drops off at f/16 – and that f/16 is the narrowest available aperture.

Matthew Richards

1 The inner barrel extends at shorter focus distances, to as little as 4.5cm from the subject in full 1.0x macro shooting.

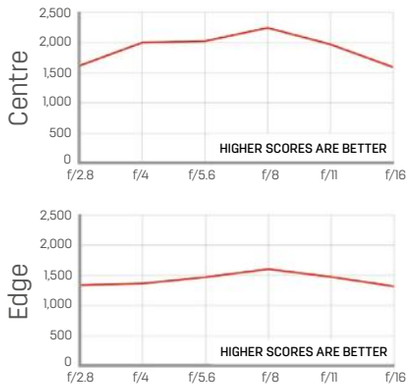
2 On-board controls include AF/MF and autofocus limiter switches, as well as a focus hold button.

3 Eight optical elements are arranged in seven groups, which include an aspherical front element and an ED (Extra-low Dispersion) element.

SPECIFICATIONS

Full-frame compatible Yes
Effective focal length 50mm (75mm APS-C)
Image Stabiliser No
Minimum focus distance 0.16m
Max magnification factor 1.0x
Manual focus override Yes
Focus limit switch Yes
Internal focus No
Filter size 55mm
Iris blades 7
Weather seals Partial
Supplied accessories Caps
Dimensions (dia x length) 71 x 71mm
Weight 236g

SHARPNESS



Between the two extremes of the aperture range, these graphs show that the lens captures excellent levels of fine detail.

FRINGING NEARER 0 IS BETTER

f/2.8 0.36 **f/5.6** 0.52 **f/16** 0.75

Colour fringing is negligible: it's practically imperceptible across the entire image frame.

DISTORTION NEARER 0 IS BETTER

There's the very slightest hint of barrel distortion, but it's pretty much unnoticeable.

WE SAY...

The Sony FE 50mm f/2.8 Macro works very well as both a 'standard' and a macro prime lens, with excellent handling and very good overall image quality.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
IMAGE QUALITY	★★★★½
VALUE	★★★★☆
OVERALL	★★★★½

BUDGET TELEPHOTO ZOOMS

Matthew Richards looks at appealing and cost-effective telephoto options

FOR many of us, the purchase of our first compact system or SLR camera kit will be closely followed by buying a telephoto zoom lens. It's an obvious addition, enabling extra telescopic reach that's ideal for shooting anything from family fun to action sports and wildlife. Budget-friendly options are plentiful, but there's been a shift in the market lately.

Many of the latest own-brand offerings from camera manufacturers are designed for 'crop sensor' rather than full-frame bodies. It makes sense, because reducing the size of the image circle that a lens delivers enables a more compact and lightweight build. The physical size and purchase price are therefore more in keeping with entry-level APS-C format and Micro Four Thirds cameras.

Meanwhile, Sigma and Tamron (the two main independent manufacturers) are bucking the trend. They both used to make budget telephoto zooms for crop-sensor cameras, but now only manufacture full-frame compatible lenses for this sector of the market. Let's see how the main contenders compare.

THE CONTENDERS

1	**Canon** EF-S 55-250mm f/4-5.6 IS STM	£270/$300
2	**Fujinon** XC50-230mm f/4.5-6.7 OIS II	£320/$400
3	**Nikon** AF-P DX 70-300mm f/4.5-6.5G ED VR	£300/$400
4	**Olympus** M.Zuiko ED 75-300mm f/4.8-6.7 II	£390/$450
5	**Panasonic** 45-150mm f/4.0-5.6 ASPH OIS	£180/$250
6	**Pentax** 55-300mm f/4.5-6.3 DA PLM WR	£400/$400
7	**Sigma** APO 70-300mm f/4-5.6 DG Macro	£150/$200
8	**Tamron** SP 70-300mm f/4-5.6 Di VC USD	£300/$450

Mount option: Canon EF-S

Canon EF-S 55-250mm f/4-5.6 IS STM

£270/$300

Small, light and affordable

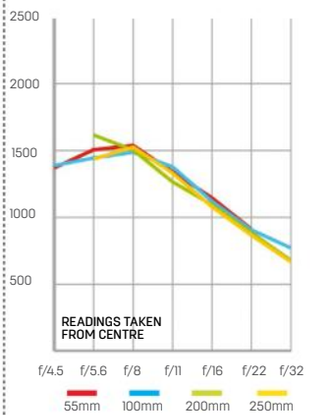
ABOUT half the price of Canon's new full-frame compatible 70-300mm tele zoom, this 'EF-S' optic for APS-C format bodies is smaller, lighter and more affordable. It gives a powerful effective reach of 400mm at the long end of its zoom range; while at the short end, it picks up where an 18-55mm kit lens hits the end-stop.

An upgrade over the previous IS II model, the STM lens features redesigned optics and a stepping motor instead of a basic electric motor for powering autofocus. As used in many of the rival lenses, a stepping motor enables smooth and virtually silent autofocus transitions that are well suited to both stills and video capture.

Performance

Outright telephoto reach falls short of some of the lenses on test, but sharpness is maintained very well throughout the entire zoom range. The optical image stabiliser also performs well, with an effectiveness of about 3.5 stops. Handling is an improvement over previous generations of the lens, in that the focus ring no longer rotates during autofocus.

SHARPNESS HIGHER IS BETTER



Crucially for a telephoto lens without a 'fast' aperture rating, sharpness remains good.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.11 **Mid** 1.07 **Tele** 1.52

There's very little colour fringing, which remains consistent throughout the range.

DISTORTION NEARER 0 IS BETTER

Wide -1.52 **Mid** 0.18 **Tele** 0.88

Slight barrel distortion at 55mm dies out at mid-zoom settings. Pincushioning is slight.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★★☆
OVERALL	★★★★★

Mount option: Fujifilm X

Fujinon XC50-230mm f/4.5-6.7 OIS II

£320/$400

Cross your palm with silver

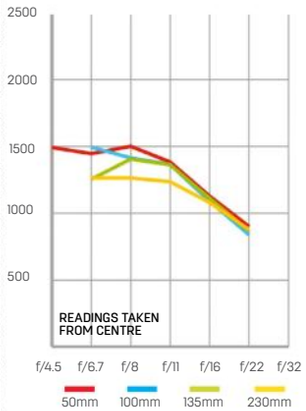
AVAILABLE in silver and black options to colour-coordinate with Fujifilm's range of X-series bodies, this lens is practically identical in size and weight to the Canon. With a smaller zoom range and Fujifilm's 1.5x crop factor, the maximum effective reach is a more modest 345mm.

With the usual stepping motor autofocus, manual override of autofocus and fully manual focusing are available via an electronically coupled 'fly by wire' focus ring. Focus modes and operation of the 3.5-stop optical image stabiliser are selected via camera menus – the lens lacks control switches. As in the Canon and Nikon lenses, the mounting plate is plastic rather than metal. The overall build feels lightweight.

Performance

Sharpness and contrast are good throughout most of the zoom range, even at the widest available apertures. Autofocus speed is pretty good under decent lighting but, coupled with our X-T10 body, we had a lot of autofocus hunting and false positives for focus acquisition in dull conditions.

SHARPNESS HIGHER IS BETTER



It starts off well, but sharpness drops off in the 135-230mm sector of the zoom range.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.00 **Mid** 0.6 **Tele** 0.43

There's very little fringing at 50mm, and it reduces at mid to long zoom settings.

DISTORTION NEARER 0 IS BETTER

Wide 0.12 **Mid** -0.01 **Tele** -0.16

With corrections applied automatically, there's practically no distortion to be seen.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★½☆
VALUE	★★★½☆
OVERALL	★★★½☆

Mount option: Nikon DX

Nikon AF-P DX 70-300mm f/4.5-6.5G ED VR

£300/$400

Smoother autofocus with Pulse AF

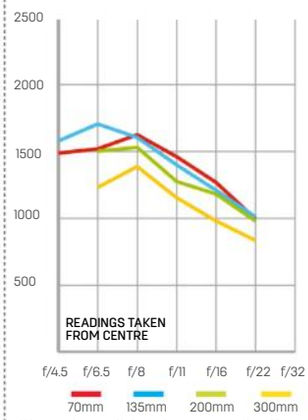
NIKON is the latest manufacturer to jump on the stepping motor bandwagon: it's used for autofocus in this AF-P (Pulse) lens. It's available with or without VR (Vibration Reduction); the edition without stabilisation is a little cheaper to buy. Both are fully compatible with D3300/3400, D5300/5500/5600 and D500 bodies, but completely incompatible with many older Nikon cameras like the D7000, where autofocus and even manual focusing are unavailable.

The 300mm focal length and 1.5x crop factor of Nikon's DX format gives an effective reach of 450mm, overtaking the Canon and Fujinon lenses. It's physically bigger and heavier, and relies on a camera menu for switching off stabilisation. This can't be done in some 'compatible' Nikon cameras, even after a firmware update.

Performance

In our lab tests, the non-VR version of the lens proved slightly sharper than the VR edition. However, the four-stop stabiliser is particularly effective in hand-held shooting, with the VR lens yielding more consistently sharp images.

SHARPNESS HIGHER IS BETTER



It's good overall, but sharpness tails off in the 250-300mm sector of the zoom range.

FRINGING (AT F/8) LOWER IS BETTER

Wide 2.37 **Mid** 3.21 **Tele** 4.07

The Nikon is an underachiever, relying on automatic corrections in recent cameras.

DISTORTION NEARER 0 IS BETTER

Wide -0.74 **Mid** 1.49 **Tele** 1.22

There's slight barrel distortion at 70mm, and pincushion peaks at mid-zoom settings.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★½☆
VALUE	★★★½☆
OVERALL	★★★★½

Mount option: Micro Four Thirds

Olympus M.Zuiko ED 75-300mm f/4.8-6.7 II

£390/$450

It's like a tiny super-telephoto

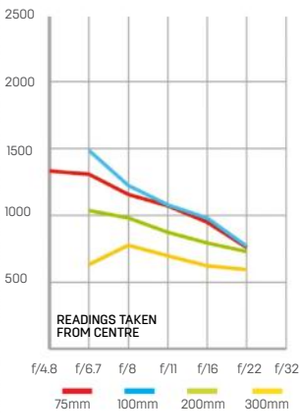
BOOSTED by the 2x crop factor of the Micro Four Thirds system, this 75-300mm lens delivers a monstrous effective zoom range of 150-600mm. That's super-telephoto territory in full-frame terms, from a lens that's slightly smaller and heavier than the Nikon 70-300mm.

Build quality feels a little more robust than in some of the lenses on test, with a metal rather than plastic mounting plate. A stepping motor enables quick yet smooth autofocus transitions, along with electronically coupled manual focusing. There are no on-board switches or controls, other than the zoom and focus rings. Unlike all the lenses we've covered so far, the Olympus has no optical image stabiliser, instead relying on in-camera, sensor-shift stabilisation.

Performance

On an OM-D E-M5 II body, image stabilisation equated to four stops, so the lack of an optical stabiliser isn't a concern. Autofocus is fast and accurate, and manual focusing is precise. Image quality is pleasing, although sharpness at the long end of the zoom range proved disappointing in our tests.

SHARPNESS HIGHER IS BETTER



Scores based on close-range test charts are poor, but real-world results were better.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.08 **Mid** 0.31 **Tele** 0.42

Lateral chromatic aberrations are tuned out by the camera automatically.

DISTORTION NEARER 0 IS BETTER

Wide 0.21 **Mid** 0.93 **Tele** 1.24

Pincushion distortion is a little noticeable towards the long end of the zoom range.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★½☆
VALUE	★★★★☆
OVERALL	★★★★½

Mount options: Micro Four Thirds

Panasonic 45-150mm f/4.0-5.6 ASPH OIS

£180/$250

Comes up a bit short

LOOKING every inch like a 'standard' zoom but smaller than most, the Panasonic lens is incredibly compact and light. Indeed, at just 62 x 73mm and 200g, it's only about half the length of most competitors, and only a quarter of the weight of some in this test.

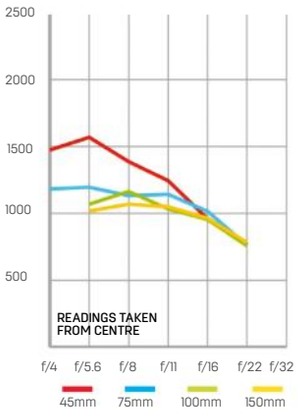
The downside is that maximum telephoto reach is similarly small. Applying the 2x crop factor of the Micro Four Thirds system, you still only get an effective focal length of 300mm at the long end. Even so, the Panasonic equals the maximum reach of a traditional 70-300mm budget tele zoom on a full-frame SLR.

Performance

Testing the lens on a Panasonic G7, we found autofocus to be fast and reliable. The optical stabiliser is worth about 2.5 stops, so doesn't compare favourably with the non-stabilised Olympus MFT lens on a late-generation Olympus body with sensor-shift stabilisation.

Image quality is pretty good on the whole but, despite its modest zoom range, we found that the Panasonic is actually quite soft at the long end.

SHARPNESS HIGHER IS BETTER



Sharpness is good at 45mm, but lacklustre in the mid to long sector of the zoom range.

FRINGING (AT F/8) LOWER IS BETTER

Wide 0.56 **Mid** 0.25 **Tele** 0.27

Automatic corrections for colour fringing are applied in both raw and JPEG modes.

DISTORTION NEARER 0 IS BETTER

Wide 0.08 **Mid** 0.75 **Tele** 0.68

Automatic corrections are applied in-camera, so these scores are flattering.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★☆☆
VALUE	★★★½☆
OVERALL	★★★★☆

Mount options: Pentax K

Pentax 55-300mm f/4.5-6.3 DA PLM WR

£400/$400

Clever design, quality build

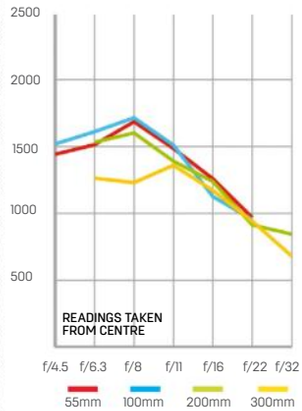
FOR a 'budget' lens, the build quality of the Pentax feels particularly good, and it's the only lens in the whole group to feature weather seals. It's big on zoom range, equating to 82.5-450mm on a Pentax APS-C format body, yet physically small when stowed away. This is thanks to a clever retractable design that enables the lens to collapse down to just 89mm in length. Even so, it's the joint longest here, along with the Tamron, when it's used at its maximum zoom setting.

Like all the lenses apart from the Sigma and Tamron contenders, the Pentax features a stepping motor autofocus system, the near-silence of which is an improvement over some of Pentax's notably noisy lenses. There's no optical image stabilisation, with the lens instead relying on in-camera stabilisation.

Performance

The autofocus system is quick and highly accurate. Testing the lens on a K-70 body, we found stabilisation to work well, with a four-stop effectiveness. Despite having the outright biggest zoom range of any lens in the test group, image quality is excellent.

SHARPNESS HIGHER IS BETTER



There's impressive sharpness and contrast throughout the zoom range.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.83 **Mid** 0.32 **Tele** 2.26

Negligible at mid-zoom settings, fringing only rises a little at each end of the range.

DISTORTION NEARER 0 IS BETTER

Wide -1.68 **Mid** 0.92 **Tele** 1.29

Barrel and pincushion distortions are well controlled at short and long zoom settings.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★★½
OVERALL	★★★★½

Mount options: Canon EF | Nikon FX | Pentax K | Sony A | Sigma SA

Sigma APO 70-300mm f/4-5.6 DG Macro

£150/$200

Great value but relatively crude

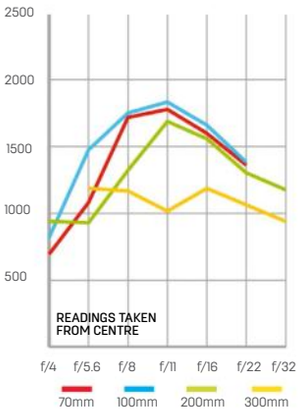
WITH a classic 70-300mm zoom range, the effective reach of this full-frame compatible lens is boosted on an APS-C format camera. It's available in Canon, Nikon, Pentax and Sony (A-fit) mount options. In all cases, a switch on the lens barrel enables shorter focusing in the 200-300mm sector of the zoom range, with a macro magnification ratio of up to 0.5x. That beats any other lens on test.

The APO (apochromatic) edition is claimed to produce less colour fringing than the standard version of the lens. Even so, it's quite basic in some respects, with a noisy electric motor for autofocus. It's the only lens in the group in which the focus ring and the front element rotate during focusing, and there's no optical stabilisation.

Performance

Image quality is a little lacklustre compared with all the other, relatively new, designs of lenses. Sharpness and contrast are both disappointing, especially when shooting wide-open. The lack of a stabiliser can be a real problem in Canon and Nikon bodies, which lack sensor-shift stabilisation.

SHARPNESS HIGHER IS BETTER



In tests and real-world shooting, the Sigma gave the worst performance in the group.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.32 **Mid** 2.18 **Tele** 3.78

Colour fringing is well controlled at 70mm, but gets worse at mid to long settings.

DISTORTION NEARER 0 IS BETTER

Wide 0.41 **Mid** 3.02 **Tele** 2.33

Pincushion distortion is quite noticeable in the middle sector of the zoom range.

VERDICT

FEATURES	★★★☆☆
BUILD & HANDLING	★★★☆☆
PERFORMANCE	★★★☆☆
VALUE	★★★☆☆
OVERALL	★★★½☆

Mount options: Canon EF | Nikon FX | Sony A

Tamron SP 70-300mm f/4-5.6 Di VC USD

£300/$450

A stickler for tradition

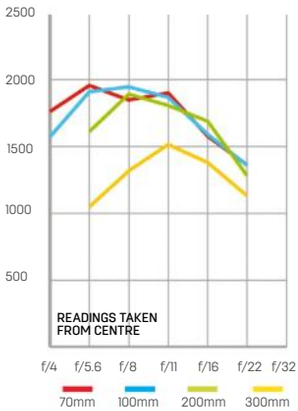
THE Tamron is very conventional, but it follows the traditions of high-end rather than budget telephoto zooms. As such, it has a ring-type ultrasonic autofocus system that enables full-time manual override, and not just when the stepping motor is being powered by the camera body. It also means you get a physical, mechanical link for manual focusing, which operates with smooth precision, complete with a focus distance scale beneath a viewing window.

Switches are fitted on the barrel for AF/M focus modes and VC on/off. The Vibration Compensation system is Tamron's proprietary form of optical stabilisation, and is fitted to both the Canon and Nikon mount options of the lens. The Sony A-fit version of the lens relies on in-camera stabilisation instead.

Performance

Autofocus is fast and effective and, throughout testing on Nikon D7200 and D750 bodies, we found the stabiliser had an effectiveness of four stops. Image quality is very good overall, matched by top build quality that combines sturdy barrel parts with a metal mounting plate.

SHARPNESS HIGHER IS BETTER



Sharpness only drops when combining the longest zoom setting and widest aperture.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.12 **Mid** 1.42 **Tele** 2.23

Even in the corners, colour fringing is well controlled throughout the zoom range.

DISTORTION NEARER 0 IS BETTER

Wide -0.34 **Mid** 2.01 **Tele** 1.97

Very minor barrel distortion at 70mm, and pincushion is controlled at longer lengths.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★☆
VALUE	★★★★★
OVERALL	★★★★½

THE VERDICT

Pentax powers ahead

The Pentax 55-300mm f/4.5-6.3 DA PLM WR is a worthy winner

PERHAPS it's splitting hairs to say that the Pentax has the biggest outright zoom range of any lens in the group. What's more important is that it delivers excellent image quality, has refined handling characteristics, and is very robust for a 'budget' telephoto zoom, complete with weather seals.

The Canon and Nikon lenses are good choices for APS-C format bodies. The Canon isn't overly generous in telephoto reach, while the Nikon is only compatible with a limited number of recent cameras. For both Canon and Nikon cameras, we prefer the Tamron lens, which has superior build quality and performance, as well as being full-frame compatible.

For Micro Four Thirds, the Olympus 75-300mm wins out over the compact Panasonic 45-150mm, not only for its extreme telephoto reach, equivalent to 600mm, but for its sharper image quality. For Fujifilm shooters, the XC50-230mm is a smart buy at the price and delivers pleasing image quality, but we had a few autofocus problems.

The Sigma APO 70-300mm is an antiquated design that seems past its sell-by date, and is in need of a revamp.

HOW THE LENSES COMPARE	Canon EF-S 55-250mm f/4-5.6 IS STM	Fujinon XC50-230mm f/4.5-6.7 OIS II	Nikon AF-P DX 70-300mm f/4.5-6.5G ED VR	Olympus M.Zuiko ED 75-300mm f/4.8-6.7 II	Panasonic 45-150mm f/4.0-5.6 ASPH OIS	Pentax 55-300mm f/4.5-6.3 DA PLM WR	Sigma APO 70-300mm f/4-5.6 DG Macro	Tamron SP 70-300mm f/4-5.6 Di VC USD
Contact	www.canon.co.uk	www.fujifilm.co.uk	www.nikon.co.uk	www.olympus.co.uk	www.panasonic.com	www.pentax.co.uk	www.sigma-imaging-uk.com	www.tamron.co.uk
Street price	£270/$300	£320/$400	£300/$400	£390/$450	£180/$250	£400/$400	£150/$200	£300/$450
Mount options	EF-S	X	DX	MFT	MFT	FK	EF FX K A SA	EF FX A
Elements/groups	15/12	13/10	14/10	18/13	12/9	14/11	14/10	17/12
Diaphragm blades	7	7	7	7	7	9	9	9
Min aperture	f/22-32	f/22	f/22-32	f/22	f/22	f/22-32	f/22	f/32
Optical stabilizer	Yes	Yes	Yes	No	Yes	No	No	Yes (C N only)
Autofocus motor type	Stepping motor	Stepping motor	Stepping motor	Stepping motor	Stepping motor	Stepping motor	Electric motor	Ring-type ultrasonic
Internal zoom/focus	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/No	No/Yes
Min focus distance	0.85m	1.1m	1.1m	0.9m	0.9m	0.95m	0.95m	1.5m
Max magnification	0.29x	0.2x	0.22x	0.24x	0.17x	0.3x	0.5x	0.25x
Filter size	58mm	58mm	58mm	58mm	52mm	58mm	58mm	62mm
Mounting plate	Plastic	Plastic	Plastic	Metal	Metal	Metal	Metal	Metal
Weather seals	No	No	No	No	No	Yes	No	No
Included accessories	None	Hood	None	None	Hood	Hood	Hood, soft case	Hood
Dimensions (diameter x length)	70 x 111mm	70 x 111mm	72 x 125mm	69 x 117mm	62 x 73mm	77 x 89mm	77 x 122mm	82 x 143mm
Weight	375g	370g	415g	423g	200g	442g	550g	765g
FEATURES	★★★★☆	★★★★☆	★★★★☆	★★★½☆	★★★½☆	★★★★½	★★★☆☆	★★★★½
BUILD & HANDLING	★★★★☆	★★★½☆	★★★½☆	★★★★☆	★★★½☆	★★★★½	★★★☆☆	★★★★½
PERFORMANCE	★★★★☆	★★★½☆	★★★½☆	★★★½☆	★★★☆☆	★★★★½	★★★☆☆	★★★★☆
VALUE	★★★★☆	★★★½☆	★★★½☆	★★★★☆	★★★½☆	★★★★½	★★★☆☆	★★★★★
OVERALL	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★½	★★★★☆	★★★★½

STANDARD PRIME LENS www.sigma-imaging-uk.com

Sigma 30mm f/1.4 DC DN | C £240/$340

This standard prime aims for quality on a budget

SIGMA'S 30mm Art-line lens for Canon and Nikon APS-C format SLRs has excellent build quality and handling and good optical performance. This new sibling offers the same effective 45mm focal length and f/1.4 aperture rating for Sony E-mount cameras, or 60mm in Micro Four Thirds fit.

It's from the Contemporary line, which is more budget-friendly than the Art series. It's also only a third of the weight of the 30mm Art lens, at just 140g, making it a well-balanced optic for small compact system cameras.

Build & handling

The optical design includes two aspherical elements to boost image quality and compactness. Sigma claims the new lens rivals its Art-line optics for image quality. The built-in stepping motor enables quick and virtually silent autofocusing, with smooth transitions when shooting video.

There are no switches or buttons on the lens barrel; the only moving part is the manual focus ring. The ring is electronically coupled but well-damped, enabling smooth and precise adjustments. Focusing is fully internal, so the front element neither extends nor rotates. The front element is a little recessed within the barrel, and the lens comes with a hood. Aperture is controlled by a nine-blade diaphragm.

Performance

There's plenty of bite, even at f/1.4, with impressive sharpness and contrast, along with fairly minimal vignetting. Bokeh is smooth, despite the challenge of getting a tight depth of field with a 30mm lens. Resistance to ghosting and flare is excellent.

Autofocus proved very fast and accurate throughout our testing with a Sony Alpha 6000 body. Overall, this Contemporary class lens performs better than Sigma's 30mm f/1.4 Art lens for Canon and Nikon cameras, as well as its relatively slow f/2.8 Art lens for Sony E-mount and MFT cameras.

Matthew Richards

1 Like a variety of previous Sigma lenses, the main construction material is a high-quality TSC (Thermally Stable Composite).

2 The Sony E and Micro Four Thirds mounting plates are made from brass, but lack weather-seal rings.

3 The large fly-by-wire focus ring operates smoothly and enables precise adjustments.

SPECIFICATIONS

Full-frame compatible No
Effective focal length 45mm (Sony), 60mm (MFT)
Image stabiliser No
Minimum focus distance 0.3m
Max magnification factor 0.14x
Manual focus override Yes
Focus limit switch No
Internal focus Yes
Filter size 52mm
Iris blades 9
Supplied accessories Hood, caps
Dimensions (dia x length) 65 x 73mm
Weight 140g

SHARPNESS

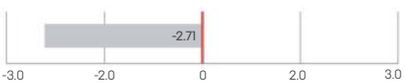
Wide-aperture sharpness is excellent across almost the whole frame, and the extreme borders soon catch up.

FRINGING NEARER 0 IS BETTER

f/1.4 1.72 **f/5.6** 1.67 **f/16** 1.72

Colour fringing is hard to spot, even around high-contrast transitions at the corners.

DISTORTION NEARER 0 IS BETTER



There's noticeable barrel distortion, but it's uniform and easy to correct when editing.

WE SAY...

The combination of excellent image quality and handling, along with a fast f/1.4 aperture rating, makes the Sigma 30mm f/1.4 DC DN | C a bargain buy.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★½
IMAGE QUALITY	★★★★★
VALUE	★★★★★
OVERALL	★★★★½

MONSTER ZOOMS

Matthew Richards tests long lenses for shooting wildlife and action

WHETHER you're shooting birds in the garden or planes at an airshow, you'll need long telephoto reach. This month we're focusing on zoom lenses for leading SLRs that go large on focal length, without going overly large on price. We're therefore not including monster prime and zoom lenses that cost a fortune, and have set ourselves a price limit of under £2,000 (or a little over $2,000). With competing lenses starting at £740/$1,000 and giving extravagant reach of up to 600mm, there are plenty of options to choose from. There are some appealing own-brand Canon and Nikon lenses to choose from, but they face stiff competition from the likes of Sigma and Tamron, especially when it comes to telephoto reach. Let's go wild!

THE CONTENDERS

1 **Canon** EF 70-300mm f/4-5.6L IS USM £1,190/$1,350
2 **Canon** EF 100-400mm f/4.5-5.6L IS £1,790/$2,050
3 **Nikon** AF-S 80-400mm f/4.5-5.6G ED VR £2,090/$2,300
4 **Nikon** AF-S 200-500mm f/5.6E ED VR £1,180/$1,400
5 **Sigma** APO 50-500mm f/4.5-6.3 DG OS HSM £850/$1,660
6 **Sigma** 150-600mm f/5-6.3 DG OS HSM | C £740/$990
7 **Sigma** 150-600mm f/5-6.3 DG OS HSM | S £1,200/$2,000
8 **Tamron** SP 150-600mm f/5-6.3 Di VC USD £730/$870

Photo: duangnapa_b / Shutterstock

Mount option: Canon EF

Canon EF 70-300mm f/4-5.6L IS USM

£1,190/$1,350

Not your average 70-300mm

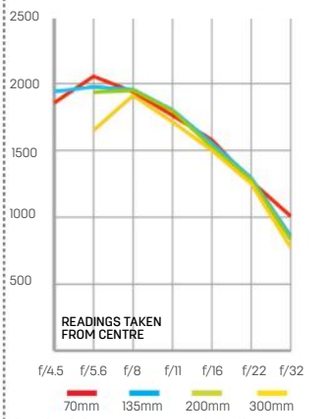
MOST 70-300mm lenses have a 'budget' feel to them, but not this L-series (Luxury) lens from Canon. It features two UD (Ultra-low Dispersion) elements, plus a four-stop image stabiliser with a switchable panning mode. Typical L-series telephoto trappings include comprehensive weather-seals and an off-white finish to reduce heat build-up.

Like the other seven lenses on test, there's a ring-type ultrasonic autofocus system with full-time manual override. In keeping with its relatively short maximum focal length, this is the lightest lens in the group at just over a kilogram, and it's the only one that's supplied without a tripod collar, although one is available as an option.

Performance

Canon claims the autofocus system is optimised specifically for this lens, and it's certainly fast and accurate. Sharpness and contrast are excellent throughout the entire zoom range. However, for wildlife photography, this full-frame compatible lens is better suited to an APS-C format body, where it has an effective maximum reach of 480mm.

SHARPNESS HIGHER IS BETTER



Levels of sharpness are consistently excellent throughout the zoom range.

FRINGING (AT F/8) LOWER IS BETTER

Wide 2.31 **Mid** 0.46 **Tele** 1.57

There's a small amount of colour fringing at 70mm and even less at longer settings.

DISTORTION NEARER 0 IS BETTER

Wide -1.65 **Mid** 0.39 **Tele** 1.94

Fairly low degrees of distortion switch from barrel to pincushion through the range.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★★☆
OVERALL	★★★★½

Mount option: Canon EF

Canon EF 100-400mm f/4.5-5.6L IS II USM

£1,790/$2,050

A Canon zoom with a new twist

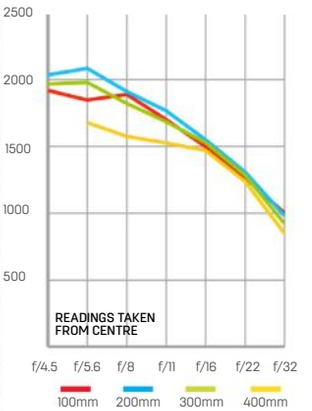
THIS and the competing Nikon 80-400mm have both been recently revamped. The most obvious change here is that the often-disliked trombone-style zoom mechanism has been replaced by a zoom ring. This helps to avoid any unwanted zoom creep when mounted on a tripod, while enabling free and easy zooming when you're in the mood. The build includes a full set of weather-seals.

Top-quality glass includes fluorite and Super UD elements to boost sharpness and contrast and reduce chromatic aberrations, along with Canon's ASC (Air Sphere Coating) to tackle ghosting and flare. There's also an updated four-stop stabiliser with three operating modes, including one similar to Nikon's 'sport' mode, where stabilisation is only applied during actual exposures.

Performance

Fast autofocusing is pretty much the same as in Canon's 70-300mm lens, and there's nothing to choose in levels of sharpness and contrast at equal zoom settings. However, sharpness from the 100-400mm drops off at the long end, and it's more expensive.

SHARPNESS HIGHER IS BETTER



It's very good throughout most of the zoom range, but drops off a little at 400mm.

FRINGING (AT F/8) LOWER IS BETTER

Wide 2.44 **Mid** 0.57 **Tele** 0.03

Slight fringing at 80mm becomes virtually imperceptible at mid to long settings.

DISTORTION NEARER 0 IS BETTER

Wide -1.1 **Mid** -0.17 **Tele** 1.33

Barrel and pincushion distortions at either end of the zoom range are quite minimal.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★½☆
OVERALL	★★★★½

Mount option: Nikon FX

Nikon AF-S 80-400mm f/4.5-5.6G ED VR

£2,090/$2,300

A major upgrade from the original

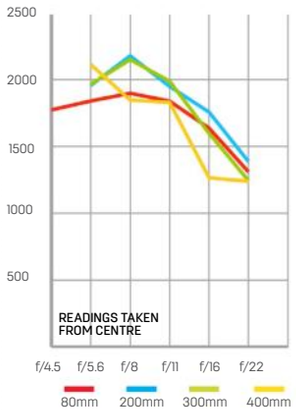
LAUNCHED at the turn of the century, the original Nikon 80-400mm was the company's first lens to feature Vibration Reduction. However, it only gave a two-stop benefit, had arguably the slowest autofocus system of any Nikon lens ever made, and couldn't autofocus at all on bodies like the D3300 and D5500, which lack in-camera AF drive.

This new AF-S version features fast and near-silent ring-type ultrasonic autofocus, and an updated stabiliser that gives a four-stop advantage. Even so, the stabiliser isn't quite as effective as that of the Nikon 200-500mm lens on test, and lacks the latter's 'sport' mode. Optical highlights include four ED (Extra-low Dispersion) elements plus a Super ED element. The lens lacks the Canon 80-400mm's weather-seals, but has a sealed mounting plate.

Performance

Performance is impressive but, considering it's the most expensive lens in the group, it's a shame some of Nikon's latest developments are lacking, like an electromagnetically controlled diaphragm to improve rapid-fire continuous shooting.

SHARPNESS HIGHER IS BETTER



The Nikon does a good job of retaining sharpness at its longest zoom setting.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.35 **Mid** 0.56 **Tele** 0.77

Colour fringing is well controlled throughout the zoom range.

DISTORTION NEARER 0 IS BETTER

Wide 0.32 **Mid** 1.07 **Tele** 1.2

There's barely any distortion at the short end, and slight pincushion at the long end.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★½
VALUE	★★★½☆
OVERALL	★★★★½

Mount option: Nikon FX

Nikon AF-S 200-500mm f/5.6E ED VR

£1,180/$1,400

Big reach at an affordable price

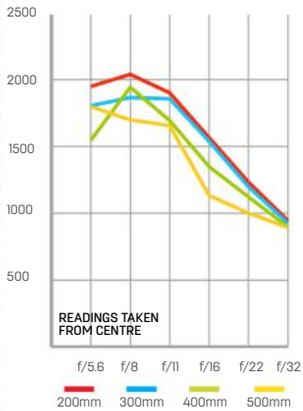
FOR a Nikon lens, the new 200-500mm is competitively priced, although it's still rather more than the Sigma C-line and Tamron 150-600mm lenses. Even so, it's less than two thirds of the price of the Nikon 80-400mm, while boasting some updated features, including an improved VR system that's rated at 4.5 stops and a 'sport' mode. As in the Canon 100-400mm lens, this applies stabilisation only during actual exposures, making it easier to track erratically moving wildlife through the viewfinder.

Unlike the 80-400mm, it has an electromagnetically controlled diaphragm for more consistent continuous shooting. However, it lacks the 80-400mm's dual-mode autofocus settings: instead, priority goes to manual override.

Performance

The autofocus system isn't quite as fast as in the 80-400mm, but it's no slouch. Impressive sharpness is on a par with the 80-400mm right up to the 400mm setting, and only drops off a little at 500mm. The lens doesn't feature Nikon's Nano Crystal Coat, but resistance to ghosting and flare is still good.

SHARPNESS HIGHER IS BETTER



It's sharper at 500mm than the competing Sigma C and Tamron 150-600mm lenses.

FRINGING (AT F/8) LOWER IS BETTER

Wide 0.3 **Mid** 0.85 **Tele** 2.21

There's less colour fringing than from the Nikon 80-400mm at the short end.

DISTORTION NEARER 0 IS BETTER

Wide 1.22 **Mid** 1.36 **Tele** 1.14

Minimal pincushion distortion remains quite constant throughout the zoom range.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★½
VALUE	★★★★½
OVERALL	★★★★½

Mount options: Canon EF | Nikon FX | Pentax K | Sigma SA | Sony A

Sigma APO 50-500mm f/4.5-6.3 DG OS HSM

£850/$1,660

Superzoom meets super-telephoto

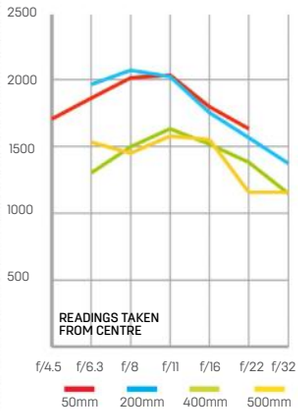
MOST telephoto zoom lenses have a 4x zoom range or thereabouts, but this Sigma is more like a superzoom lens, with a huge 10x zoom range. It can come in useful for wildlife shooting, where you need to quickly switch between standard and super-telephoto focal lengths: for example capturing a group of animals, then zooming in for a close-up.

This is a redesigned edition of Sigma's original 50-500mm lens, and adds an optical stabiliser. A little unusually, the stabiliser is fitted in all mount options, although stabilisation doesn't work with Pentax's *ist series or K100D. For cameras that feature a sensor-shift stabiliser, you get the choice of whether to use in-camera or in-lens stabilisation. Quality glass includes four SLD (Special Low Dispersion) elements.

Performance

The lens' ring-type ultrasonic autofocus system is fairly rapid but not super-fast. Edge-sharpness is a little lacking at both ends of the zoom range, but centre-sharpness is very good on the whole, only really dropping off in the 400-500mm sector.

SHARPNESS HIGHER IS BETTER



Edge-sharpness is a little poor, but centre-sharpness only drops off at the long end.

FRINGING (AT F/8) LOWER IS BETTER

Wide 4.18 **Mid** 1.56 **Tele** 3.29

Colour fringing is worse than average, especially towards both extremities.

DISTORTION NEARER 0 IS BETTER

Wide -1.48 **Mid** 1.54 **Tele** 1.8

Barrel and pincushion distortions can be a little more noticeable than usual.

VERDICT

FEATURES	★★★½☆
BUILD & HANDLING	★★★½☆
PERFORMANCE	★★★½☆
VALUE	★★★★☆
OVERALL	★★★★½

Mount options: Canon EF | Nikon FX | Sigma SA

Sigma 150-600mm f/5-6.3 DG OS HSM | C

£740/$990

It's feature-rich but low in price

A LONG with the competing Tamron 150-600mm, this Sigma is the most affordable lens in the group – but it has a comparatively high-end set of features. Like the Nikon 80-400mm, it has a dual-mode autofocus system that can give priority to auto or manual focusing.

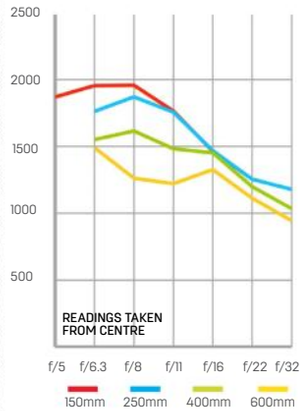
The dual-mode optical stabiliser is also more effective than that of the Sigma 50-500mm lens, and custom autofocus and stabiliser modes can be selected via a switch on the lens barrel. The catch is that you must set these up with Sigma's optional USB Dock (£40/$60).

To avoid zoom creep, you can engage the zoom lock switch at any position that has a marked focal length on the zoom ring. Build quality feels good; although the lens isn't fully weather-sealed, it does have a rubber sealing ring on the mount.

Performance

The speed of autofocusing is pretty quick, similar to that of the Nikon 200-500mm and Tamron 150-600mm lenses. As is often the case, sharpness drops off at the long end of the zoom range, but less noticeably than in the Tamron lens.

SHARPNESS HIGHER IS BETTER



There's less of a drop-off at the long end of the zoom range than in the Tamron.

FRINGING (AT F/8) LOWER IS BETTER

Wide 2.08 **Mid** 1.48 **Tele** 1.16

Control over colour fringing is good, but not quite as good as from the Tamron.

DISTORTION NEARER 0 IS BETTER

Wide 1.39 **Mid** 1.4 **Tele** 1.41

There's a little pincushion distortion throughout the zoom range.

VERDICT

FEATURES	★★★★½
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★★☆
VALUE	★★★★★
OVERALL	★★★★½

Mount options: Canon EF | Nikon FX | Sigma SA

Sigma 150-600mm f/5-6.3 DG OS HSM | S

£1,200/$2,000

It's a 'sport' lens by name and nature

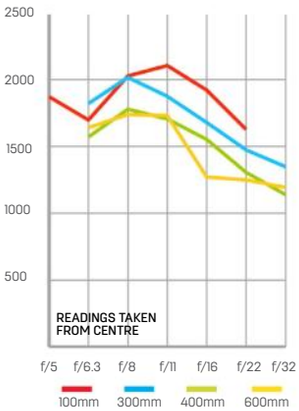
ALL of the high-end features of the Sigma 150-600mm Contemporary lens are present in this Sport edition as well. It also has the same count of three SLD (Special Low Dispersion) optical elements, but boosts the number of top-grade FLD (Fluorite Low Dispersion) elements from one to two, with a larger diameter. It's physically a bigger lens and is 50 per cent heavier, weighing in at nearly 3kg. It therefore feels rather more substantial, and comes with a carrying strap that attaches to lugs on the lens barrel.

A bonus for rainy-day shooting is that, unlike the C lens, this one features a full set of weather-seals instead of just a sealed mount. All fit options include a highly effective, dual-mode stabiliser for static and panning shots.

Performance

The autofocus system is noticeably faster than in the other Sigma and Tamron 150-600mm lenses, more on a par with the Canon 100-400mm and Nikon 80-400mm lenses. It also retains much better sharpness at the long end of its zoom range.

SHARPNESS HIGHER IS BETTER



Excellent sharpness is maintained all the way through the extensive zoom range.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.99 **Mid** 0.58 **Tele** 1.01

There's little fringing, with lab scores marginally better than from the Sigma C.

DISTORTION NEARER 0 IS BETTER

Wide 0.64 **Mid** 0.73 **Tele** 0.95

There's excellent control over distortion, with negligible amounts at any focal length.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★½
PERFORMANCE	★★★★★
VALUE	★★★★★
OVERALL	★★★★★

Mount options: Canon EF | Nikon FX | Sony A

Tamron SP 150-600mm f/5-6.3 Di VC USD

£730/$870

Light, simple and affordable

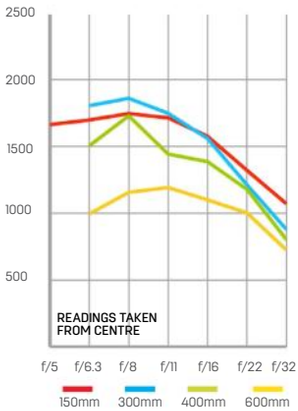
THE Tamron gives the same enormous telephoto reach as the Sigma C-line lens, in a similarly compact and lightweight package. At 106 x 258mm and 1,951g, it's slightly smaller and noticeably lighter than the Nikon 200-500mm. Even so, the Tamron feels well put together and, unlike the Nikon and Sigma counterparts, features a full set of weather seals.

Controls are fairly basic, with only a single autofocus mode that gives the usual full-time manual override from its ring-type ultrasonic system. Similarly, VC (Vibration Compensation) has no dedicated panning mode: Tamron claims that its system is effective for both static and panning shots. The optical path includes an LD (Low Dispersion) element and a fluorite-grade XLD (eXtra Low Dispersion) element, along with eBand coatings to reduce flare.

Performance

Performance is good in most respects, with quick autofocus. Sharpness is good across most of the zoom range – but drops off more at the long end than with any of the other lenses on test.

SHARPNESS HIGHER IS BETTER



It's good overall, but drops off noticeably in the 500-600mm sector of the zoom range.

FRINGING (AT F/8) LOWER IS BETTER

Wide 1.06 **Mid** 0.72 **Tele** 1.59

It beats Sigma's 150-600mm lenses at the short end, but isn't as good at the long end.

DISTORTION NEARER 0 IS BETTER

Wide 1.42 **Mid** 1.52 **Tele** 1.47

The fairly low amount of pincushion distortion is similar to that of the Sigma C.

VERDICT

FEATURES	★★★★☆
BUILD & HANDLING	★★★★☆
PERFORMANCE	★★★½☆
VALUE	★★★★½
OVERALL	★★★★☆

THE VERDICT

Sigma wins on performance and price

The Sigma 150-600mm Sport puts the 'super' into super-telephoto

FOR mighty telephoto reach at an affordable price, the Sigma 150-600mm Sport lens reigns supreme for high-end features, performance and all-round image quality. It's a superb choice for wildlife photography, if heavier than most competing lenses.

If you're after a smaller, lighter lens with the same telephoto reach, the Sigma 150-600mm Contemporary lens has the same advanced features as the S and is amazing value. It's not as sharp as the Sigma S lens at full stretch, but still sharper than the competing Tamron lens. The older Sigma 50-500mm is only really worth considering if you need its extended zoom range.

For own-brand options, the Canon 100-400mm and Nikon 80-400mm are the most upmarket, but both come up short on maximum telephoto reach.

HOW THE CAMERAS COMPARE	Canon EF 70-300mm f/4-5.6L IS USM	Canon EF 100-400mm f/4.5-5.6L IS II USM	Nikon AF-S 80-400mm f/4.5-5.6G ED VR	Nikon AF-S 200-500mm f/5.6E ED VR	Sigma APO 50-500mm f/4.5-6.3 DG OS HSM	Sigma 150-600mm f/5-6.3 DG OS HSM | C	Sigma 150-600mm f/5-6.3 DG OS HSM | S	Tamron SP 150-600mm f/5-6.3 Di VC USD
Website	www.canon.co.uk		www.nikon.co.uk		www.sigma-imaging-uk.com			www.tamron.co.uk
Street price	£1,190/$1,350	£1,790/$2,050	£2,090/$2,300	£1,180/$1,400	£850/$1,660	£740/$990	£1,200/$2,000	£730/$870
Mount options	EF	EF	FX	FX	EF FX K SA A	EF FX SA	EF FX SA	EF FX A
Elements/groups	16/11	21/16	20/12	19/12	22/16	20/14	24/16	20/13
Diaphragm blades	8 blades	9 blades	9 blades	9 blades	9 blades	9 blades	9 blades	9 blades
Min aperture	f/32-45	f/32-40	f/32-40	f/32	f/22	f/22	f/22	f/32
Optical stabiliser	4 stops	4 stops	4 stops	4.5 stops	4 stops	4 stops	4 stops	4 stops (C N only)
Autofocus motor type	Ultrasonic (ring-type)	Ultrasonic (ring-type)	Ultrasonic (ring-type)	Ultrasonic (ring-type)	Ultrasonic (ring-type)	Ultrasonic (ring-type)	Ultrasonic (ring-type)	Ultrasonic (ring-type)
Internal zoom/ focus	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Angle of view (diagonal)	34-8 degrees	24-6 degrees	30-6 degrees	12-5 degrees	47-5 degrees	16-4 degrees	16-4 degrees	16-4 degrees
Min focus distance	1.2m	0.98m	1.5m	2.2m	0.5-1.8m	2.8m	2.6m	2.7m
Max magnification	0.21x	0.31x	0.2x	0.22x	0.32x	0.2x	0.2x	0.2x
Filter size	67mm	77mm	77mm	95mm	95mm	95mm	105mm	95mm
Weather seals	Yes	Yes	Sealed mount	Sealed mount	None	Sealed mount	Yes	Yes
Included accessories	Hood	Hood, tripod collar, soft case	Hood, tripod collar, pouch	Hood, tripod collar, soft case	Hood, tripod collar, step-down ring	Hood, tripod collar	Hood, tripod collar	Hood, tripod collar
Dimensions (dia x length)	89 x 143mm	94 x 193mm	96 x 203mm	108 x 268mm	104 x 219mm	105 x 260mm	121 x 290mm	106 x 258mm
Weight	1,050g	1,640g	1,570g	2,300g	1,970g	1,930g	2,860g	1,951g
FEATURES	★★★★☆	★★★★½	★★★★☆	★★★★½	★★★½☆	★★★★½	★★★★★	★★★★☆
BUILD & HANDLING	★★★★½	★★★★½	★★★★½	★★★★☆	★★★½☆	★★★★☆	★★★★½	★★★★☆
PERFORMANCE	★★★★½	★★★★½	★★★★½	★★★★½	★★★½☆	★★★★☆	★★★★★	★★★½☆
VALUE	★★★★☆	★★★½☆	★★★½☆	★★★★½	★★★★☆	★★★★★	★★★★★	★★★★½
OVERALL	★★★★½	★★★★½	★★★★☆	★★★★½	★★★½☆	★★★★½	★★★★★	★★★★☆

TELEPHOTO LENS www.fujifilm.co.uk

Fujifilm Fujinon XF100-400mm f/4.5-5.6 R LM OIS WR £1,500/$1,900

This top-grade super-telephoto has great credentials

FUJIFILM has been manufacturing professional-grade lenses for the photographic, TV and movie industries for decades. The relatively recent XF mount lenses have earned an excellent reputation for build quality and image quality. This new 100-400mm super-telephoto zoom is an 'R' lens with a built-in aperture ring; it has an LM (Linear Motor) autofocus system, OIS (Optical Image Stabilisation) and a WR (Weather-Resistant) construction as standard.

Build & handling

Fujifilm says the lens has a compact and lightweight design; however, despite being an APS-C format lens that produces a small image circle, it's about the same size as the latest Canon 100-400mm and Nikon 80-400mm full-frame compatible lenses.

It's a little lighter, and the crop factor of Fujifilm's compact system cameras give the lens a monstrous 'effective' zoom range of 152-609mm. Build quality is excellent, the zoom and focus rings are smooth and precise, and there's no hint of zoom creep.

The aperture ring comes with a mode switch to enable automatic or manual control. The autofocus system employs two linear motors to boost speed, along with a range limiter switch that can lock out sub-5m focusing. The optical stabiliser has a five-stop rating (Cipa-tested), and includes automatic horizontal panning detection. The weather-resistant construction features 13 seals, plus a water-repellent fluorine coating on the front element.

Performance

Making the most of its five ED (Extra-low Dispersion) elements, plus one Super ED element, sharpness and contrast are spectacular, along with minimal colour fringing. Distortions are essentially non-existent, and there's impressive resistance to ghosting and flare. The autofocus system is super-fast and well able to track moving objects, while being virtually silent.

Matthew Richards

1 The front element has a fluorine coating, and the filter attachment thread is 77mm. A sliding panel in the lens hood gives access for filter rotation.

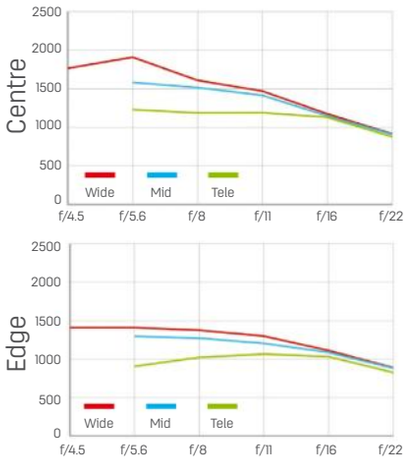
2 Switches are on hand for OIS on/off, auto/manual aperture control, an autofocus range limiter (5m to infinity) and zoom lock.

3 The supplied tripod collar makes for balanced tripod or monopod-based shooting, with very easy rotation between landscape or portrait orientation.

SPECIFICATIONS

Full-frame compatible No (APS-C only)
Effective focal length 152-609mm
Image stabiliser Yes (five stops)
Minimum focus distance 1.75m
Max magnification factor 0.19x
Manual focus override Yes
Focus limit switch Yes (5m to infinity)
Internal zoom/focus No/Yes
Filter size 77mm
Iris blades 9
Weather seals Yes
Supplied accessories Hood, caps, tripod mounting ring
Dimensions (dia x length) 95 x 211mm
Weight 1,375g

SHARPNESS



Typical of telephoto zooms, sharpness drops off a little at the long end, but images still look superbly detailed with plenty of bite.

FRINGING (AT F/8) NEARER 0 IS BETTER

Wide 0.24 Mid 0.27 Tele 0.33

Lateral chromatic aberration is low through the entire aperture and zoom ranges.

DISTORTION NEARER 0 IS BETTER

Wide -0.01 Mid 0.02 Tele 0.01

There's no distortion at any focal length, from the middle of the range to both extremities.

WE SAY...

Competitively priced for a super-telephoto zoom, this outstanding and beautifully engineered lens delivers spectacular performance and is a joy to use.

VERDICT

FEATURES	★★★★★
BUILD & HANDLING	★★★★★
PERFORMANCE	★★★★★
VALUE	★★★★½
OVERALL	★★★★★

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