We test 12 colour printers, ranging from low-end models intended for occasional colour printing to more expensive ones capable of near photographic quality output

Show your colours

The latest buzzword to spread through the PC community is colour in, colour out. There are plenty of ways to get a colour image into your PC – scan a colour photograph, take a photo using a digital camera or even create one from scratch using an image-editing program.

Once a PC has a colour image though, getting it out and onto paper is a trickier prospect. Sure, a colour inkjet printer is the cheapest way to do it in the comfort of your own home or office, but with the bewildering number of models available, which one should you go for?

We've tested 12 printers with prices ranging from £149 to £480. This covers low-end printers intended for occasional colour printing, up to more expensive models that can produce prints rivalling actual photos. Since few of us have the money (or room) to justify two printers, a single model should be capable of giving its best with text and graphics, so we've tested each printer with both.

Colour printing technology
With the exception of the Alps model, all the printers here are inkjet printers. Inkjet printing was invented by Canon and Hewlett-Packard independently and although both companies' technology is essentially the same, Canon chooses to call it bubblejet printing.

Epson's printers are also inkjets but they use a variant on the Canon and Hewlett-Packard system that allows higher print resolutions.

The Alps MD-2010 is based on Micro Dry Ink technology and uses ink stored on reels of tape. Micro Dry printing is near silent, works on a wide variety of surfaces and produces prints that are colour-fast and waterproof.

One or two cartridges?
The Olivetti JP 170S can only have one ink cartridge fitted at any one time – either colour (CMY – cyan, magenta and yellow) or black (K).

This has two disadvantages. First, if you're printing black text and want to switch to graphics, the cartridges must be physically swapped. Second, the black on colour prints is made by mixing cyan, magenta and yellow. If a page of mixed black text and colour graphics is printed, this means that the colour cartridge can be quickly depleted as all three colours are used to print the text.

The other inkjet printers use two cartridges – one for cyan, magenta and yellow (CMY), and one for black (K). Not only can both black and colour prints be made without swapping cartridges, but graphics and mixed text/graphics can be printed with black ink.

The Olivetti JP 790 is claimed to be a five-ink printer. It still only has two cartridges – one containing cyan, magenta, yellow and black for graphics printing, and one containing black for text printing. Our tests show that this makes little difference to colour prints, when compared to other printers.

Since colour cartridges contain three colours of ink, they must be replaced as soon as one colour runs outs. If you plan on printing a lot of red pages, for example, this can prove expensive.

The Alps MD-2010 uses four separate cartridges – one each for cyan, magenta, yellow and black. Cartridges are also available in metallic colours – gold, silver, and so on. Since each colour can be replaced separately, these printers might be worth considering if you want to print in a single colour or have special effects.

Cartridge life
All manufacturers quote the life of their cartridges along the lines of '300 pages at 10 percent coverage'. For text, this is a relatively accurate way of measuring cartridge life as not that much ink is used even for full pages.

A full-page graphic, however, can easily have 80 percent coverage since there is very little white space left once a page is printed. This means that manufacturers' estimates for colour cartridge life are optimistic at best.

Illustration by Jon Mason

Resolution
The resolution of a printer is measured in the number of individual dots of ink it can place in a square inch. For example, the Hewlett-Packard DeskJet 670C has a maximum resolution of 600x300dpi (dots per inch), which means it can place 180,000 dots of ink in one square inch.

● **Enlargement of part of parrot on page 98 showing image constructed from dots.**
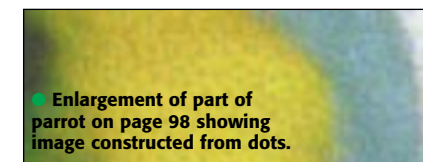
Generally, the higher the resolution, the better the printout. For text anyway – it gets more confusing for graphics, however. Colour inkjet printers have four colours of ink – cyan, magenta, yellow and black. Other shades are produced by varying the density of dots of each colour. To the naked eye, the dots look like a single shade and the smaller the dots, the better the effect.

Unfortunately, high resolution doesn't always mean a printer produces the best colour output. The 720x720dpi output of the Epson Stylus Color 400, for example, is better on some images than the Lexmark 7000's 1,200x1,200dpi output.

To confuse things still further, the Epson Stylus Photo can vary the size and shape of the dots it places on the page.

If you're buying a printer primarily for colour graphics, look at the quality of the output first and the resolution second.

Print and paper quality
Almost all of the inkjet printers gave reasonably sharp and distinct text when printed at the highest resolution on standard photocopier paper.

The Olivetti JP 790 produced text that was spidery around the edges, caused by too much ink soaking into the paper. The 1,200x600dpi text output of the Alps MD-2010, on the other hand, is devastatingly sharp and almost indistinguishable from laser output. It is sensitive to which side of the paper it prints on (rough or smooth) though. Since this paper is reasonably cheap, a printer that can use it for acceptable text output is a bonus.

Full-page graphics are usually less successful on photocopier paper as the ink tends to soak into the page, rippling the paper and giving a blurry image. The inkjet printers gave images of varying quality on photocopier paper. Most were either murky and poorly detailed or too bright with little colour depth. Exceptions were the Lexmark 7000 and Epson Stylus Photo, which gave sharp, detailed images with clear colours. The Alps' Micro Dry printing fell short on plain paper, giving images rife with white flecks where ink hasn't fully transferred.

All printers give improved colour graphics output on more expensive coated or glossy paper. In this test the least impressive were the HP and Olivetti printers and glossy paper gave little visible benefit. Most impressive were the Epson printers with each giving extremely detailed and vivid colour output.

Print speed
When printing at the highest resolution on plain paper, the speed of text output of the printers varied wildly. The Canon BJC-4200 took nearly an hour to produce 10 pages at 360x360dpi, whereas the Hewlett-Packard DeskJet 870Cxi churns them out in less than five minutes.
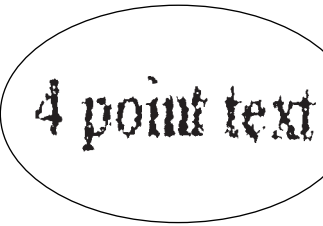
Epson Stylus Color 400

Plain paper

Plain paper performance of the Epson Stylus Color 400 depends to an extent on the image. The parrot test image is a little subdued with colours looking a little flat but this isn't apparent on other images.
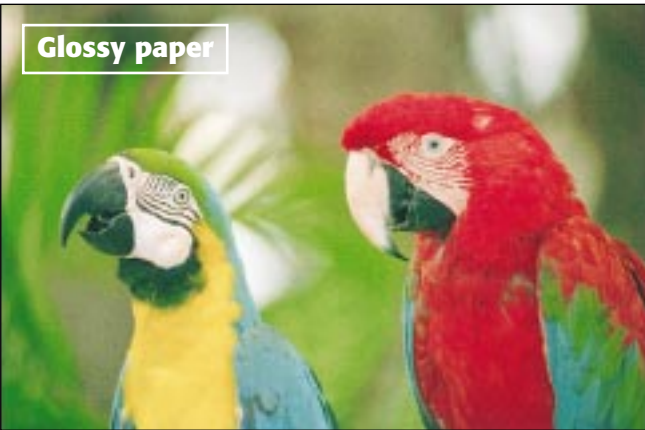
Glossy paper

On glossy paper, the Stylus Color 400 is a revelation. Images are detailed with vivid colours and sharp contrast. At around 50p for a full-page glossy print, they're also relatively inexpensive.

4 point text

The Stylus Color 400's 720x720dpi text isn't the sharpest of all but the standard photocopier paper is partly to blame for this.

Lexmark 7000

Plain paper

The Lexmark 7000's plain paper performance is a little more even than the Stylus Color 400's, with colours being a touch brighter. There's also less soak-through of ink on the page, though neither printer causes any paper rippling.

Glossy paper

Even at 1,200x1,200dpi, the Lexmark 7000's performance on glossy paper isn't up to the same standard as the Stylus Color 400's. Colours are deeper but the increase in resolution has little overall effect. Glossy prints are also pricey, at around 90p for a full A4 page.

4 point text
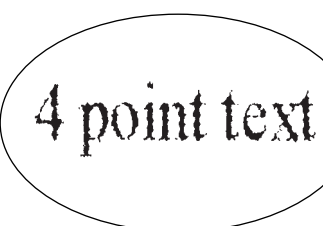
Text performance on plain paper is impressive, giving sharp, black characters that are clearly discernible down to a typesize of three points.

Epson Stylus Photo

Plain paper

The Epson Stylus Photo is the best of all when it comes to printing graphics on plain paper. To the naked eye, the parrot image has almost no discernible dots (the printer can vary the size and shape of them) and colours are clear and bright.
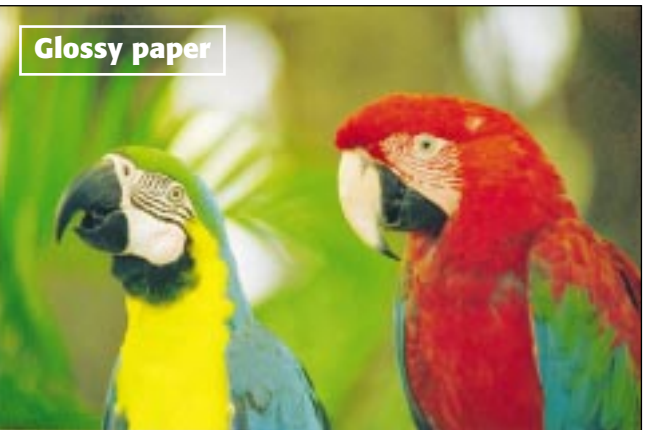
Glossy paper

Graphic output on glossy paper is absolutely astounding. Colours are vivid and the level of detail is very impressive. Prints are also relatively inexpensive, at around 50p a sheet.

4 point text
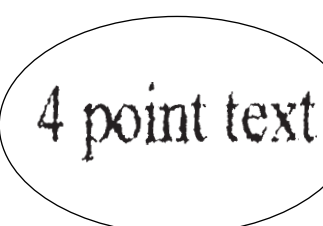
Text output is better than the Stylus Color 400 but doesn't quite match the Lexmark 7000. Characters are sharp and well-defined and clearly legible down to four points.

Coated paper

On coated paper, the Canon BJC-4220 performs extremely well, producing clearly defined images with deep, vivid colours. Look closely though and even at the resolution of 720x360dpi, you can see the coloured dots that make up the image.

Inkjet process
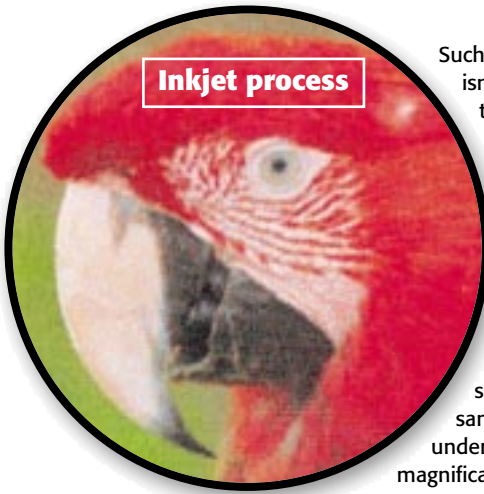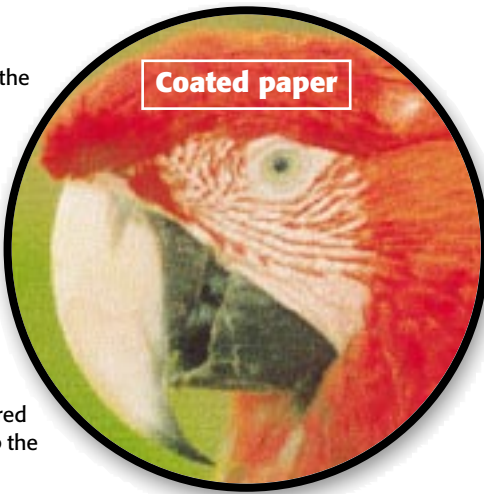
Such 'dottiness' isn't a fault of the printer but inkjet printing technology. Even the Epson Stylus Photo, with its variable dot size, shows the same problem under magnification.

Dye-sublimation

Compare this to the Alps MD-2300 (reviewed last month). When used as a dye-sublimation printer on special paper (it also works as a Micro Dry printer), it mixes ink on the page to produce images with areas of continuous colour. Images remain smooth even under magnification, making the MD-2300 a true photographic-quality printer. The downside is cost – around £2.50 per page.
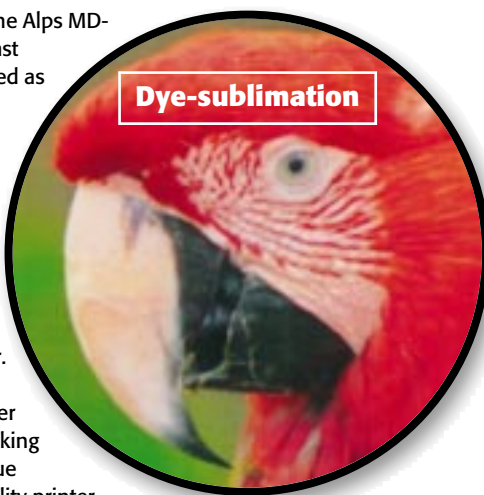
Graphics speeds are similarly disparate but print quality is an issue. The Canon BJC-70 can print a full-colour page on plain paper in less than three minutes, but the quality is only suitable for occasional use. The Epson printers, however, take around three to six minutes to produce excellent colour pages.
Printing on special paper takes much longer, not least because the printer allows more time for the ink to dry on the page.

Printer cable
None of the printers tested comes with a cable but all require a bi-directional parallel cable, which will add another £5 to £10 to the price. You should check that the cable is long enough to reach from your PC to where the printer will stand.

Warranty
All printers come with at least a year's warranty, some with more. With the exception of the Lexmark and Olivetti models, the warranty involves returning the printer to the manufacturer for repair. Warranties can usually be converted to on-site ones for more money and this might be worth considering if the printer is important to your business.

We feel that the *Epson Stylus Color 400* **offers the best all-round performance and it gets our Best Buy Award. At a touch over £250, graphics quality on both plain and glossy paper is outstanding and pages are produced swiftly to boot. Text isn't produced particularly quickly but it's sharp enough at 720dpi.**

The *Lexmark 7000* **comes in a close second – and it is extremely close. Marginally more expensive than the Epson Stylus Color 400, the Lexmark actually beats it at text printing, producing razor-sharp output in a third of the time. Graphics output on plain paper is a whisker away but the comparatively poor** performance on glossy paper lets the Lexmark 7000 down.
If colour graphics printing is your prime concern then the *Epson Stylus Color Photo* is definitely a printer to consider. Print quality on both plain and glossy paper is breathtaking and doesn't take an age to appear. Text output is also impressive, making this a versatile all-rounder, albeit at a price.   Julian Prokaza

Alps MD-2010 · Canon BJC 4200 · Epson Stylus Color 600 · HP DeskJet 670C · HP DeskJet 870Cxi · Lexmark 2050

Olivetti JP 790 · Epson Stylus Color 400 · Canon BJC-70 · Epson Stylus Photo · Lexmark 7000 · Olivetti JP 170S

Colour inkjet printers compared

Notes: (1) Manufacturers' recommended retail price, street price usually lower. (2) Estimates for colour pages do not include black ink costs. (3) All test print times based on highest resolution possible on given paper. (4) Graphic print timings based on full-page 300dpi graphic.

	Alps MD-2010	Canon BJC-70	Canon BJC-4200	Epson Stylus Color 400	Epson Stylus Color 600	Epson Stylus Photo	Hewlett-Packard DeskJet 670C	Hewlett-Packard DeskJet 870Cxi	Lexmark 2050	Lexmark 7000	Olivetti JP 170S	Olivetti JP 790
Price (inc VAT) (1)	£398.33	£233.83	£210.33	£254.97	£329	£480.57	£190.35	£434.75	£287.88	£299	£149	£233.83
Printer type	Micro Dry Ink	Bubblejet	Bubblejet	Piezo inkjet	Piezo inkjet	Piezo inkjet	Inkjet	Inkjet	Inkjet	Inkjet	Inkjet	Inkjet
Print method	Four-cartridge	Two-cartridge	Two-cartridge	Two-cartridge	Two-cartridge	Two-cartridge	Two-cartridge	Two-cartridge	Two-cartridge	Two-cartridge	Single-cartridge	Two-cartridge
Maximum text resolution on plain paper	1,200x600dpi	360x360dpi	360x360dpi	720x720dpi	720x720dpi	720x720dpi	600x600dpi	600x600dpi	600x600dpi	600x600dpi	600x300dpi	600x600dpi
Maximum text resolution on special paper	1,200x600dpi	720x360dpi	720x360dpi	720x720dpi	1,440x720dpi	720x720dpi	600x600dpi	600x600dpi	600x600dpi	1,200x1,200dpi	600x300dpi	600x600dpi
Maximum colour graphics resolution on plain paper	600x600dpi	360x360dpi	360x360dpi	720x720dpi	720x720dpi	720x720dpi	300x300dpi	600x300dpi	600x600dpi	600x600dpi	300x300dpi	600x600dpi
Maximum colour graphics resolution on special paper	600x600dpi	720x360dpi	720x360dpi	720x720dpi	1,440x720dpi	720x720dpi	600x300dpi	600x300dpi	600x600dpi	1,200x1,200dpi	300x300dpi	600x600dpi
Sheet-feeder capacity	100	30	100	100	100	100	100	150	150	150	40	120
Mono cartridge cost	£4	£14.10 for 3	£6.35	£17.63	£17.63	£17.63	£26.56	£26.56	£21.76	£22.01	£43.78 for print-head and 4 cartridges	£42.65 for print-head and 2 cartridges
Estimated mono cartridge life	60 pages @ 40% text coverage	170 pages @ 5% coverage	900 pages @ 5% coverage	540 text pages	540 text pages	540 text pages	1,000 pages @ 5% coverage	1,000 pages @ 5% coverage	1,000 pages @ 5% coverage	600 pages @ 5% coverage	400 pages @ 5% coverage	500 pages @ 5% coverage
Colour cartridge cost	£4.70	Black £11.75 for 3 Colour £17.61 for 3	£17.63	£22.33	£22.33	£18.74	£28.20	£28.44	£25.72	£26.54	£35.38	£49.60 for print-head and 2 cartridges
Estimated colour cartridge life	40 pages @ 60% coverage	40 pages @ 7.5% coverage	200 pages @ 7.5% coverage	300 pages @ 15% coverage	300 pages @ 15% coverage	190 pages @ 15% coverage	350 pages @ 15% coverage	500 pages @ 15% coverage	200 pages @ 15% coverage	200 pages @ 15% coverage	180 pages @ 8% coverage	130 pages @ 8% coverage
Warranty	2 years back to base	1 year back to base	3 years back to base	1 year back to base	1 year back to base	1 year back to base	1 year back to base	1 year back to base	1 year on site	1 year on site	1 year on-site exchange	1 year on-site exchange
Estimated cost per text page	£0.07	£0.03	£0.01	£0.03	£0.03	£0.03	£0.03	£0.03	£0.02	£0.04	£0.03	£0.04
Estimated cost per colour page on plain paper (2)	£0.35	£0.15	£0.09	£0.07	£0.07	£0.10	£0.08	£0.06	£0.13	£0.13	£0.20	£0.19
Estimated cost per colour page on special paper (2)	£0.41	£0.28	£0.22	£0.53	£0.53	£0.56	£0.80	£0.77	£0.92	£0.93	£1.06	£1.05
Special paper cost	£10.69 for 200 sheets of high-quality paper	£25.85 for 200 sheets of coated paper	£25.85 for 200 sheets of coated paper	£9.17 for 20 sheets of glossy paper	£9.17 for 20 sheets of glossy paper	£9.17 for 20 sheets of glossy paper	£7.17 for 10 sheets of glossy paper	£7.17 for 10 sheets of glossy paper	£39.79 for 50 sheets of inkjet glossy film	£39.79 for 50 sheets of inkjet glossy film	£17.27 for 20 sheets of glossy paper	£17.27 for 20 sheets of glossy paper
Time for 10 pages of text on plain paper (3)	22min 50sec	10min 13sec	58min 37sec	45min 10sec	31min 31sec	32min 10sec	17min 18sec	4min 42sec	17min 38sec	15min 01sec	24min 29sec	12min 31sec
Time for full-page A4 graphic on plain paper (3) (4)	7min	2min 48sec	9min 16sec	6min 32sec	5min 11sec	4'min 50sec	8min 10sec	3min 35sec	22min 51sec	9min 01sec	6min 37sec	7min 19sec
Time for full-page A4 graphic on special paper (3) (4)	6min 45sec	8min 18sec	8min 14sec	6min 26sec	9min 32sec	8min 41sec	8min 27sec	6min 12sec	22min 52sec	8min 01sec	13min 01sec	11min 27sec
Features	❺	❸	❸	❸	❸	❹	❸	❸	❸	❸	❸	❸
Text quality	❺	❸	❹	❸	❹	❹	❸	❹	❸	❺	❷	❷
Graphics quality	❹	❸	❹	❹	❹	❺	❸	❸	❸	❹	❸	❷
Value for money	❹	❹	❺	❺	❹	❹	❹	❹	❷	❺	❸	❸
Overall	❹	❸	❹	❺	❹	❹	❸	❸	❸	❺	❸	❸
Contact	Rotec Distribution 01932 571800	Canon 0500 246246	Canon 0500 246246	Canon 0500 246246	Epson 0800 220546	Epson 0800 220546	Hewlett-Packard 0990 474747	Hewlett-Packard 0990 474747	Lexmark 01628 481500	Lexmark 01628 481500	Staffords Business Machines 0151 243 3110	Staffords Business Machines 0151 243 3110
Notes	Metallic ink cartridges also available. Printer is bundled with Adobe PhotoDeluxe.	Portable printer. Rechargeable battery available.		Bundled with Sierra Print Artist, Adobe PhotoDeluxe and font pack. Drivers supplied on CD.	Bundled with Sierra Print Artist, Adobe PhotoDeluxe and font pack. Drivers supplied on CD.	Bundled with Live Pix software. Drivers supplied on CD.						Uses separate black ink cartridges for text printing.

Specifications · Features · Costs · Performance · Ratings · Notes

❶ = Poor ❷ = Below average ❸ = Average ❹ = Good ❺ = Excellent