

Personal laser printers

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PHOTOGRAPHY Hugh Threlfall

We give our black and white verdict on eight personal lasers

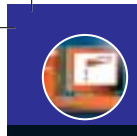
If you need your own desktop printer for relatively low volumes and don't require colour, a personal mono laser is the way to go. With running costs as little as 0.7p per page – if you choose the award-winning Kyocera Mita FS-1010 – laser prints work out significantly cheaper than inkjets.

Although speeds aren't up to the standards of workgroup lasers, the eight printers here are no slouches. All are capable of printing a single-page document in well under 20 seconds and the Canon Laser Shot LBP-1210 managed this in just over ten seconds. Lexmark's E320 is capable of 16 pages per minute as well, so even a 50-page document can be on your desk in under three and a half minutes.

Most have a paper capacity of 250 sheets, but if you need more the Samsung and Tally

hold 550 sheets as standard and both offer optional second trays. Five out of the eight offer optional network adaptors, making them ideal for a home office environment.

It goes without saying that laser text quality is unrivalled by inkjets, but print quality throughout our rigorous tests varies considerably. However, whatever your priorities, we've done the hard work to bring you the definitive *PC Pro* verdict on the most popular models available today.



How we test

PC Pro's philosophy of real-world computing is always reflected in the benchmarks we use to test products. To this end, we've put together a selection of tests that simulate print jobs that the laser printers on review will face in day-to-day use.

PERFORMANCE TESTS

Personal lasers are often used for printing short documents, and for this reason the time taken to print a single page is an important factor in the overall speed score. For longer documents, our speed test involves printing a 50-page document. Each page consists of text and one graph with a total coverage of 5 per cent. This provides a common denominator to gauge manufacturers' print-speed claims in real-world conditions.

The third test involves printing a demanding 12-page Excel workbook. Tables and graphs with shaded backgrounds are very difficult to convert to mono, and only a few printers managed the test satisfactorily.

Another performance test is a four-page PDF document, four copies of which are printed. The file contains a mixture of text and images. It also stresses printers with reverse text – white characters on a black background – and diagonal headings.

We also print a 24-page DTP document from Word, containing a mixture of text, images and graphs. All five tests are timed using the click-to-drop measurement: the time from clicking Print to the time the last page drops onto the output tray.

The results of each test can be found in the graphs on p85 as a pages-per-minute measurement, and we've included the actual timings on the feature table on as well.

QUALITY ASSESSMENT

Although the speed test print-outs are scrutinised for text and image quality, a further test pushes the printers to their limits. As laser printers struggle to reproduce smooth shading, we print a sequence of tonal gradients to highlight stepping or dithering, different width lines and text of varying point sizes. The document also contains a mono photo that we examine for detail, banding and contrast.

As quality testing is subjective, we ask three members of the Labs team to judge print-outs from each printer, and the results are then averaged to give an overall quality score. The breakdown of each printer's quality scores can be found in the feature table on p84.

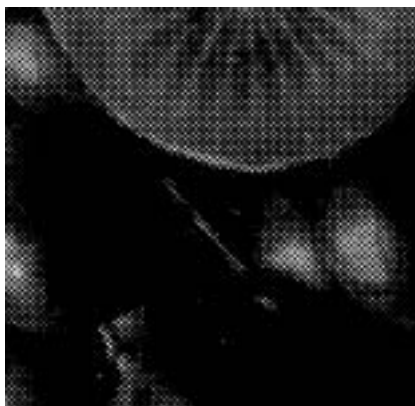
All but one of the eight printers on test has both parallel and USB interfaces, but we use the USB interfaces where available. *PC Pro's* usual test rigs are used for all testing.



Brother HL-1230.



Canon Laser Shot LBP-1210.



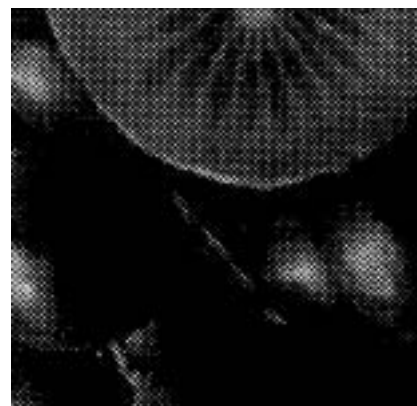
Epson EPL-5900L.



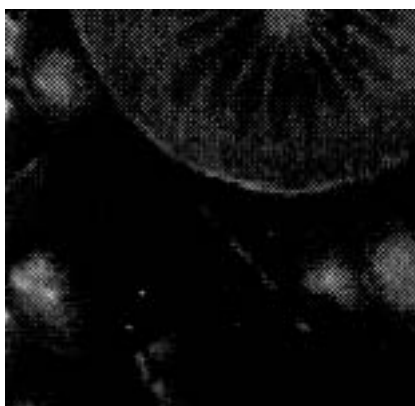
HP Laserjet 1000w.



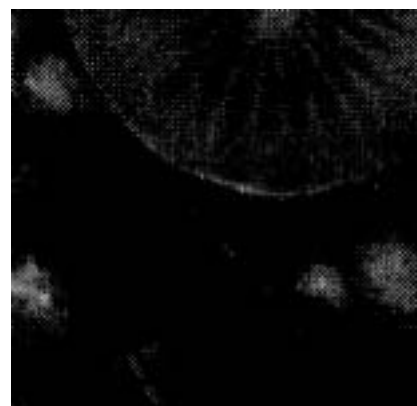
Kyocera Mita FS-1010.



Lexmark E320.



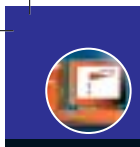
Samsung ML-1450.



Tally T9114.

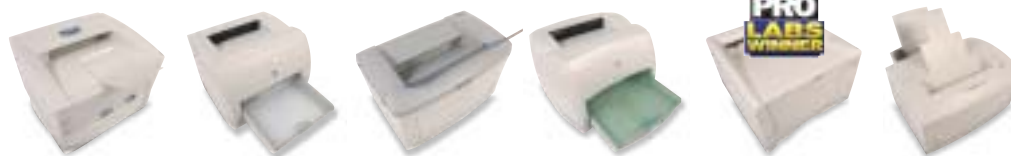
PRINT QUALITY

The images above were scanned at 1,200dpi using identical settings from original printouts of each of the eight printers on test. All printers were set to maximum resolution on the driver settings. When zoomed in this close on our quality test it's possible to see how adept each printer is at half-toning and which lay down too much toner on the page. As can be seen, the the Canon stands out from the rest.



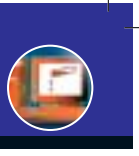
THE LABS Personal lasers

● FEATURE TABLE

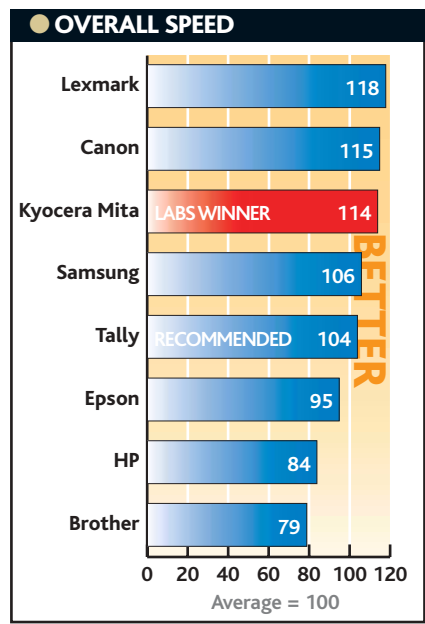
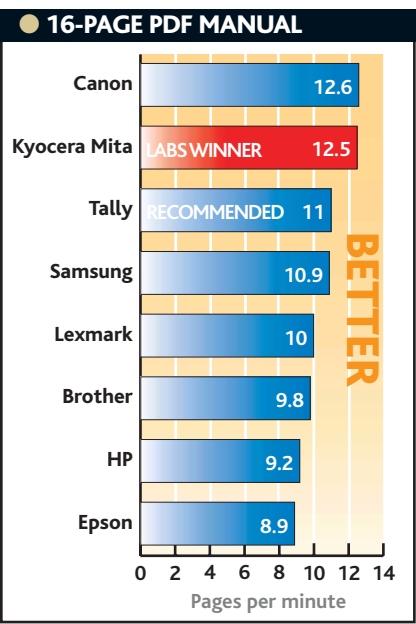
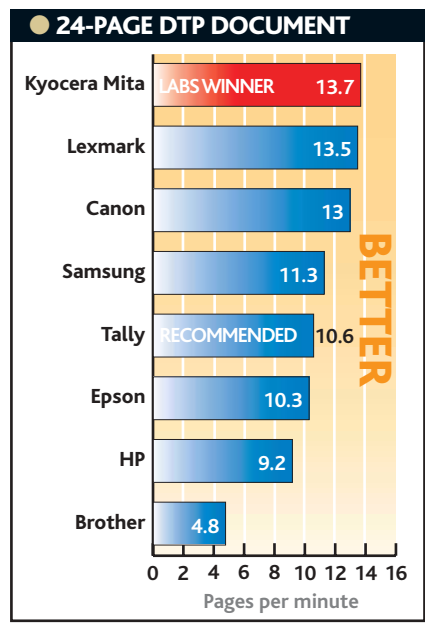
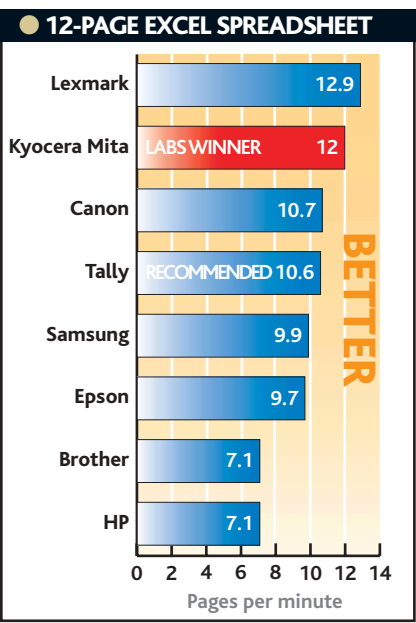
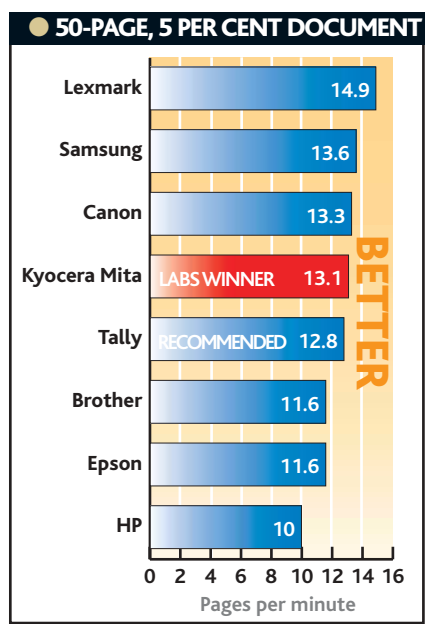
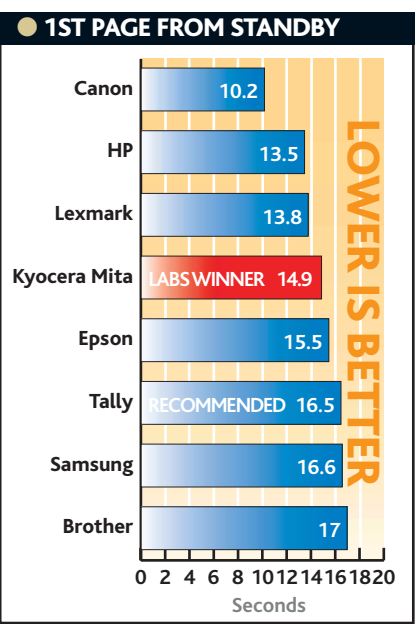


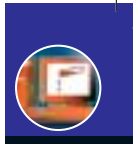
	Brother HL-1230	Canon Laser Shot LBP-1210	Epson EPL-5900L	HP Laserjet 1000w	Kyocera Mita FS-1010	Lexmark E320
OVERALL RATING	91	90	100	87	114	97
Street price (inc VAT)*	£148 (£174)	£199 (£234)	£135 (£159)	£129 (£152)	£199 (£234)	£185 (£217)
Supplier	dabs.com 0800 138 5182	Simply 0870 727 2100	Simply 0870 727 2100	Simply 0870 727 2100	Insight 0870 700 7350	dabs.com 0800 138 5182
Manufacturer's website	www.brother.co.uk	www.canon.co.uk	www.epson.co.uk	www.hp.co.uk	www.kyoceramita.co.uk	www.lexmark.co.uk
Basic warranty	1yr RTB	1yr on-site	1yr on-site	1yr RTB	2yrs RTB	1yr on-site
GENERAL SPECIFICATIONS						
Print-head technology	Laser	Laser	Laser	Laser	Laser	Laser
CPU (speed)	66MHz	16MHz	24MHz	48MHz	200MHz	67MHz
Installed memory (MB)	2	2	2	1	16	4
Maximum memory (MB)	2	2	13	1	144	68
Maximum true resolution	600 x 600dpi	600 x 600dpi	600 x 600dpi	600 x 600dpi	600 x 600dpi	600 x 600dpi
Enhanced resolution	N/A	2,400 x 600dpi	1,200dpi class	1,200dpi class	1,200dpi class	1,200dpi class
THROUGHPUT						
Claimed mono speed (pages per minute on A4)	12	14	12	10	14	16
Claimed warm-up time (seconds)	<45	<8	21	Instant	<10	<40
Claimed time to first print (seconds)	15	<10	15	<15	12	<12
Maximum duty cycle (pages per month)	15,000	2,500	15,000	7,000	10,000	10,000
Engine life (pages)	200,000	50,000 or 5yrs	180,000	84,000	100,000	Not stated
Drum life (pages)	20,000	Same as toner life	20,000	Same as toner life	100,000 or 3yrs	Same as toner life
Toner life (pages)	3,000 or 6,000 (3,000 included)	2,500	6,000 (3,000 included)	2,500	6,000	3,000 or 6,000 (1,500 included)
CONSUMABLES PRICING (EXC VAT)						
Toner cartridge	£41 (6,000 pages)	N/A	£57	N/A	£42	N/A
Image drum	£75	N/A	£42	N/A	N/A	N/A
Combined unit	N/A	£47	N/A	£39	N/A	£75 (6,000 pages)
Price per page (5 per cent coverage, excluding paper)	1.1p	1.9p	1.2p	1.6p	0.7p	1.25p
POWER/ENVIRONMENTAL						
Power-saving modes supported	Energy Star	Energy Star	Energy Star	Energy Star	Energy Star	Energy Star
Ozone generation standards supported	Not stated	Not stated	Blue Angel	<0.01 parts per million	<0.02 parts per million	Blue Angel
Power consumption when printing (W)	340	180	330	214	265	375
Power consumption in maximum power-saving mode (W)	<5	5	10	<7	5	9
Noise level when printing (dB)	49	48	49	52	<50	49
Toner saving (amount if relevant)	✓	✓, up to 50%	✗	✓, 50%	✓, ECOprint	✓, up to 50%
LANGUAGE SUPPORT AND EMULATIONS						
PCL level	✗	✗	6	5e emulation	6	5e emulation
PostScript level	✗	✗	✗	✗	KPDL2 (Level 2 compatible)	✗
Other	Windows GDI	CAPT	Epson Controller	Windows GDI	Windows GDI	Windows GDI
PAPER HANDLING						
Standard input tray capacity (pages)	250	250	150	250	250	150
Standard output tray capacity (pages)	150	125	100	125	150	100
Minimum paper weight (g/m ²)	60	64	60	60	60	60
Maximum paper weight (g/m ²)	161	135	163	163	163	163
Manual feed input	1 sheet	10 sheets	10 sheets	✗	50 sheets	1 sheet
DRIVERS INCLUDED						
Windows 98/ME	✓	✓	✓	✓	✓	✓
Windows 2000	✓	✓	✓	✓	✓	✓
Windows NT 4	✓	✓	✓	✗	✓	✓
Windows XP	✓	✓	✓	✓	✓	✓
Mac OS/Linux	✗	✗	Mac OS 8.1+	✗	Mac OS (all), Linux	Mac OS 8.6+
DRIVER FEATURES						
Real-time status display	✗	✓	✓	✗	✗	✓
Watermark	✓	✗, overlay	✓	✓	✓	✓
Multiple pages per sheet	✓	✓	✓	✓	✓	✓
Scaling/zoom	✓	✓	✓	✓	✓	✓
Manual duplex	✓	✗	✗	✓	✗	✓
PHYSICAL FEATURES						
Print cancel button	✓	✗	✗	✗	✓	✗
Toner save button	✗	✗	✗	✗	✗	✗, driver option
Number of status lights	4	1	2	2	4	6
Interfaces	Parallel	USB 2, parallel	USB 1.1, parallel	USB 1.1	USB 1.1, parallel	USB 1.1, parallel
Optional items	10BaseT Ethernet	10/100BaseTX Ethernet	✗	✗	250-sheet paper cassette, serial, 10/100BaseTX Ethernet	250-sheet paper cassette
Dimensions W x D x H (mm)	360 x 370 x 235	388 x 581 x 254	399 x 240 x 245	415 x 486 x 253	378 x 375 x 222	380 x 362 x 221
Weight (kg)	9.2	8.2	7.9	8	12.3	9
QUALITY RESULTS (score out of ten)						
Text quality	9	9	9	8	9.5	8
Spreadsheet	6	6	8.5	7.5	8	6.5
PDF (text and images)	8.5	6.5	7	7	7	4
Photo quality test	9	5	6.5	6.5	8	7.5
Total	32.5	26.5	31	29	32.5	26
SPEED RESULTS						
50-page, 5 per cent letter (minutes:seconds)	2:18	3:46	2:18	4:59	2:49	3:22
First page out from standby (seconds)	17	10.2	15.5	13.5	14.9	13.8
12-page Excel spreadsheet (minutes:seconds)	1:42	1:07	1:14	1:41	1:00	0:56
24-page PDF document (minutes:seconds)	5:02	1:51	2:20	2:37	1:45	1:47
16-page PDF manual (minutes:seconds)	1:38	1:16	1:48	1:44	1:17	1:36
Photo quality test (seconds)	23	13	19	15	16	21

*Street prices were all correct at time of going to press.



Samsung ML-1450	Tally T9114
103	105
£199 (£234)	£169 (£199)
dabs.com 0800 138 5182	Tally 0800 652 4556
www.samsungelectronics.co.uk	www.tally.co.uk
1yr RTB	1yr on-site
Laser	Laser
66MHz	66MHz
4	4
68	68
600 x 600dpi	600 x 600dpi
1,200dpi class	1,200dpi class
14	14
<40	<40
<15	<15
12,000	15,000
150,000	150,000
Same as toner life	Same as toner life
6,000 (3,000 included)	6,000 (3,000 included)
N/A	N/A
N/A	N/A
£61	£61
1p	1p
Energy Star Blue Angel	Energy Star Blue Angel
300	300
<10	20
45	<48
✓	✓
6	6
3 (optional)	3 (optional)
Windows GDI	Windows GDI, barcode
550	550
250	250
60	60
163	163
100 sheets	100 sheets
✓	✓
✓	✓
✓	✓
✓	✓
Mac OS 8.1+	Mac OS 8.1+
X	X
✓	✓
✓	✓
✓	✓
✓	✓
✓	✓
4	4
USB 1.1, parallel	USB 1.1, parallel
550-sheet paper cassette, 10/100BaseTX Ethernet	550-sheet paper cassette, 10/100BaseTX Ethernet
362 x 409 x 294	362 x 409 x 294
11	11
8	8
6.5	6.5
5	5
4.5	4
24	23.5
3:41	3:54
16.6	16.5
1:13	1:08
2:08	2:16
1:28	1:27
26	26





Brother HL-1230

PRICE £148 (£174 inc VAT)

SUPPLIER dabs.com 0800 138 5182

VERDICT Excellent quality output, but the slowest on test. The lack of features also counts against the Brother.

Brother is well known for its laser printers, so it's perhaps surprising that the HL-1230 falls behind this month's cutting edge when it comes to specs. It has only a 66MHz CPU and 2MB of buffer RAM, with a claimed throughput of 12ppm; compare this with the Lexmark E320, capable of 16ppm for only £37 more. The HL-1230 isn't the cheapest on test either, yet only has a parallel interface and no USB port. In fact, the Brother has the fewest features on test. Driver options are fairly comprehensive, though, and you can add a network card if you want to use the printer in a small workgroup setting.

In our performance tests, the HL-1230 was the slowest overall. It managed 11.6ppm in our



50-page test, closely matching its rated speed. However, a first-page time of 17 seconds was the slowest we saw, and was two seconds behind Brother's claims. Where the HL-1230 mainly fell down was in the Excel and DTP tests. In both, which are full of images and graphs, it was significantly slower than others on test (bar the HP), which was probably caused by the slow transfer rate of the parallel port.

Despite the lack of a resolution-enhancement option, quality didn't suffer and almost matched the excellent Kyocera overall. In particular, it excelled at printing our test photo, demonstrating good detail, no banding and smooth fades. It was also the only printer that managed to print the fine lines at the correct widths – others struggled here.

If you're after quality rather than speedy prints, the Brother HL-1230 is one to consider, but bear in mind that it's noisy when printing and only comes with a one-year, return-to-base warranty.

PC PRO RATINGS			
OVERALL			
91			
QUALITY	SPEED	VALUE	
118	79	106	
100 IS THE AVERAGE			

Canon Laser Shot LBP-1210

PRICE £199 (£234 inc VAT)

SUPPLIER Simply 0870 727 2100

VERDICT The Canon is fast, but it doesn't produce the best quality and is expensive to run.

We covered the LBP-1210 four months ago (see *Reviews*, issue 97, p129), when we criticised it for poor image reproduction. Some of its problems should be solved by driver updates, but there's no sign of this yet.

For text, the Canon is fine, but it places too much toner on



the page in general. Our Excel test, which should be lightly shaded, turned black, rendering the overlying text unreadable. Only by boosting the brightness by 30 per cent could the problem be overcome. But this lightens everything else too much, making it awkward to print mixed text and images.

However, closely following the Lexmark E320, the Canon was second fastest on test. Its 14ppm engine churned out the 50-page document in well under four minutes. It also has the quickest first-page time of 10.2 seconds – handy if you regularly print short documents.

The printer driver informs you of print completion by a vocal message, which is useful if you're printing across a network using the optional Axis network adaptor. We found the status monitor helpful too, as it accurately estimates how long a print job will take and includes a progress bar.

If desk space is tight, the LBP-1210's size will count against it and like the almost identical HP 1000w, the Canon's toner only lasts 2,500 pages, which works out at nearly 2p per page. This and the print quality issues mean we can't recommend it.

PC PRO RATINGS			
OVERALL			
90			
QUALITY	SPEED	VALUE	
94	115	69	
100 IS THE AVERAGE			

Epson EPL-5900L

PRICE £135 (£159 inc VAT)

SUPPLIER Simply 0870 727 2100

VERDICT Epson's low price is reflected by a lack of features and slower engine, but quality is respectable.

Although it might not be the most attractive printer on test, the EPL-5900L is the latest in Epson's personal laser range and incorporates a 12ppm, 600 x 600dpi engine. Both parallel and USB 1.1 interfaces are present, but there's no option for a LAN interface to be added. You can't add a second paper tray either, and the 150-sheet input tray is the joint smallest on test. Plus, the tray (which doubles as the manual input tray) is simply a flap on the front of the printer, which means paper is exposed to dust when the printer isn't in use. The benefit is the small footprint when the tray is closed of just 399 x 240mm.

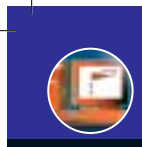


Features, then, aren't the Epson's strong point, so we looked to speed and quality. In the 50-page speed test, the EPL-5900L averaged 11.6ppm – a whisker away from its engine speed. The single-page document was produced in a reasonable 15.5 seconds too, but the PDF manual caused the Epson some problems. It took almost two minutes to print it, making it the slowest we saw for this test.

Things were brighter on the quality front, though. Text – and reverse text – was crisp and black, while the tricky Excel test was correctly shaded for superb readability. Our test photo was handled fairly well too, but banding detracted from an otherwise well-contrasted image.

The one-year, on-site warranty is welcome and can be extended to three years, but running costs with the separate toner/drum assembly are higher than others at 1.2p per page. However, at £135, the Epson offers value if you aren't fussed about the missing features.

PC PRO RATINGS			
OVERALL			
100			
QUALITY	SPEED	VALUE	
113	95	105	
100 IS THE AVERAGE			



HP Laserjet 1000w

PRICE £129 (£152 inc VAT)

SUPPLIER Simply 0870 727 2100

VERDICT The low price is negated by high running costs and slow print speeds.

In many respects, the 1000w is similar to Canon's LBP-1210, with the same looks and virtually the same print engine. Appearances can be deceptive though, as the two emerged from our tests with very different results.

While the Canon impressed with its speed, the HP lagged behind the leaders. Its engine is rated at just 10ppm and has only 1MB of memory for company, while the Canon boasts 14ppm and double the RAM. This meant our 50-page, 5 per cent document took five minutes to appear on the output tray, and the



12-page Excel document took over one minute, 40 seconds to complete, which was even slower than the Brother HL-1230. The first page emerged in 13.5 seconds, though, just fractions ahead of the speedy Lexmark.

But where we criticised the Canon for poor image quality, the HP had no such issues. It wasn't the best we saw – small fonts were less readable than on most other printers on test – but it coped well with photos and graphs. Black to white fades were fairly smooth and shading on the spreadsheet was accurately reproduced.

The 1000w isn't the most feature-packed printer, but at £129 it undercuts the Canon by £70. Oddly, there's no power switch and the two LEDs aren't labelled, making it hard to diagnose any error states. Our last gripe, which we also level at the Canon, is that the output tray is too short and print-outs spilled over the edge and onto the desk or the floor. With just a one-year, return-to-base warranty and a high page cost of 1.6p, the HP is far from being the best buy in this Labs.

PC PRO RATINGS			
OVERALL			
87			
QUALITY	SPEED	VALUE	
110	84	91	
100 IS THE AVERAGE			

Kyocera Mita FS-1010

PRICE £199 (£234 inc VAT)

SUPPLIER Insight 0870 700 7350

VERDICT Economical to run, quick to print and with decent quality to boot.

While the FS-1010 is only marginally better-looking than the Epson, it's a force to be reckoned with. Speed is no doubt aided by the beefy 200MHz PowerPC processor and 16MB of RAM.

Quality from the standard 600 x 600dpi setting is superb, and you can engage the 1,200dpi class setting for a boost of refinement. Features are plentiful too, with a



and Ethernet card are options.

In our tests, the FS-1010 managed 13.1ppm for the 50-page document and a first-page time of under 15 seconds – slightly slower than Kyocera Mita's claims. Where it overtook others was in the Excel, DTP and PDF tests. The 12-page Excel document took just one minute to print, while others took up to 40 seconds longer.

Quality was almost unrivalled. Fades, halftones, reverse text and diagonal lines were all printed effortlessly, while photos and graphs were a cut above the rest. The tough Excel test was easily readable too.

On top of these highlights, the FS-1010 is environmentally friendly and, despite its integrated toner and drum unit, costs just 0.7p per page to run. Plus, the drum unit is guaranteed for three years and the rest of the printer is covered by a two-year, return-to-base warranty. Couple this with quiet printing and a competitive price, and Kyocera Mita has a winner on its hands.

PC PRO RATINGS			
OVERALL			
114			
QUALITY	SPEED	VALUE	
125	114	110	
100 IS THE AVERAGE			

Lexmark E320

PRICE £185 (£217 inc VAT)

SUPPLIER dabs.com 0800 138 5182

VERDICT One of the fastest personal lasers around. But it's noisy, lacks features and isn't the cheapest to run.

The E320 takes the honour of being the quickest laser on test, thanks to its 16ppm 600 x 600dpi engine. Despite only possessing 4MB of RAM against the Kyocera's generous 16MB, it outpaced the competition in the majority of our tests.

It's a fairly compact unit too, having almost as small a footprint as the Epson EPL-5900L. However, its paper handling is better designed – the top-facing input and output trays mean the footprint is permanently small. And if the 150-sheet feeder becomes too limiting, a second tray can be added beneath the unit for a further 250 sheets. The long-life combined drum and toner unit lasts for 6,000 pages and costs £75,



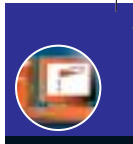
giving an average page cost of 1.25p. While this isn't as steep as Canon or HP's running costs, Kyocera remains the cheapest on test at just 0.7p per page.

In our tests, the E320 produced high-quality prints with minimal delay. The 50-page Word document was printed at 14.9ppm and we only had to wait 13.8 seconds for the single-page document. Similarly, the 12-page Excel spreadsheet was delivered in under a minute. The DTP and PDF file wasn't printed with quite the same haste, but quickly nonetheless.

The test photo was handled well with smooth transitions, good contrast and reasonable half-toning – only a little banding spoiled the overall image. Text was sharp too and business graphs were handled with ease.

One problem we had with the Lexmark was the racket it made while printing. The noisy fan would be distracting in a small office, but if it's speed you're after then the E320 certainly won't disappoint.

PC PRO RATINGS			
OVERALL			
97			
QUALITY	SPEED	VALUE	
108	118	90	
100 IS THE AVERAGE			



Samsung ML-1450

PRICE £199 (£234 inc VAT)

SUPPLIER dabs.com 0800 138 5182

VERDICT A good all-round printer, but the short warranty and tough competition see it leave without an award.

Samsung's now end-of-line ML-6060 reigned on our A List for its entire 24-month lifecycle, so the ML-1450 was under pressure to continue this success.

The new model looks almost identical and builds on the ML-6060's strengths. The 550-sheet paper tray is convenient, and the expansion potential, which includes another 550-sheet paper tray and a 100Mb/sec network adaptor, is also useful.

In our tests, though, the ML-1450 failed to beat Kyocera's identically priced and similarly specified contender. The basic text

tests couldn't separate the two: the



ML-1450 managed 13.6ppm and the FS-1010+ 13.1ppm for the 50-page document, and when it came to a single page the ML-1450 was 1.7 seconds slower at 16.6 seconds. The two printers were similarly close in our Excel and DTP tests.

Quality was slightly disappointing. All our test photos were too dark and fades weren't as smooth as the Kyocera's, even with the 1,200dpi setting enabled. The Excel shading was also on the dark side, but text remained readable.

If you want to print text, the Samsung is fine, with even reverse text super-sharp. We welcomed the toner save and print cancel buttons, but in practice the cancel button ignored us and continued printing. With just a single year of return-to-base warranty, the identical Tally, which costs £30 less but has a superior warranty, is a better deal.

PC PRO RATINGS		
OVERALL		
103		
QUALITY	SPEED	VALUE
101	106	101
100 IS THE AVERAGE		

Tally T9114

PRICE £169 (£199 inc VAT)

SUPPLIER Tally 0800 652 4556

VERDICT Expandable, well-priced and fairly speedy, Tally pips Samsung for an award.

Don't worry, you're not seeing double – the Tally T9114 is almost identical to the Samsung ML-1450. A brief glance at the feature table on p84 shows just how similar they are – Samsung provides the engine and Tally simply repackages it.

Other than the slightly redesigned manual paper feeder, there's no separating the two devices. Both are capable of 14ppm, they take the same combined toner and drum unit and have a true print resolution of 600 x 600dpi. As such, the T9114 is no slouch and sped through our tests in the same times as the ML-1450. Only a few seconds separated them throughout, hence the marginally lower speed score.



Quality differences were also undetectable. Our test photo was as poor as the Samsung's attempt and was even slightly darker. But, again, the rest of the tests were capably handled, with images only suffering along the way from too much toner and slight banding. Fortunately, there are two toner-saving modes that lighten prints enough to be acceptable and lengthen the life of the cartridge at the same time.

But, while speed and quality are rather average in this test, it's the T9114's features that lift it above the competition. There's the 550-sheet paper tray, networking option plus the comprehensive driver options, which make scaling, watermarking, n-up printing and manual duplexing a breeze.

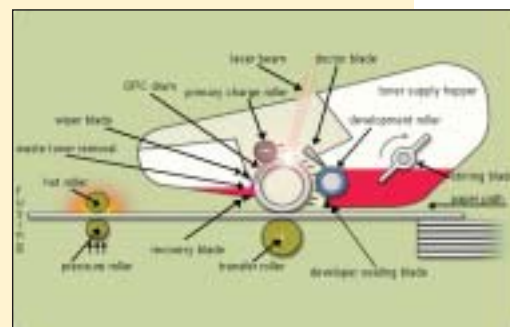
And, despite costing £30 less than Samsung's offering, the T9114 is covered by a one-year, on-site warranty, earning it the award that Samsung narrowly missed out on.

PC PRO RATINGS		
OVERALL		
105		
QUALITY	SPEED	VALUE
100	104	107
100 IS THE AVERAGE		

Focus on: toner

We explain how toner works

Unlike inkjets, which apply liquid ink to form an image on the paper, lasers use electrical charges to make the paper attract toner particles from an image drum. The toner itself is a fine powder and, in the case of the HP Laserjet 1000w, is composed



A simplified cross-section of a combined toner and drum cartridge.

of three main components: 50 per cent polystyrene resin, 30 per cent iron oxide and around 5 per cent wax.

Most of the toner used in the lasers on test is made by mixing the ingredients into strands, which are then ground down into powder. Unfortunately, this process is inexact and not particularly efficient in terms of the energy used.

The resulting particles vary in size. Some are too big and others too small, so they're sieved to gather only the particles that are the correct size – the average diameter is over 7 microns. For a comparison, it would take around 100 of these particles to make the full stop at the end of this sentence.

Another method of producing toner is to grow it chemically, the advantage being that the process gives more control over the exact size of each particle. Chemically grown toner gives a sharper appearance on the page, especially when printing fine lines and other details. Also, printing with finer particles means less toner is required to generate an image and so costs are reduced.

However, image quality relies on more than just smaller toner particles. The quality of the optical laser system, drum, developer, charge roller and fuser all play an important part in the final image you see on the page.

JIM MARTIN