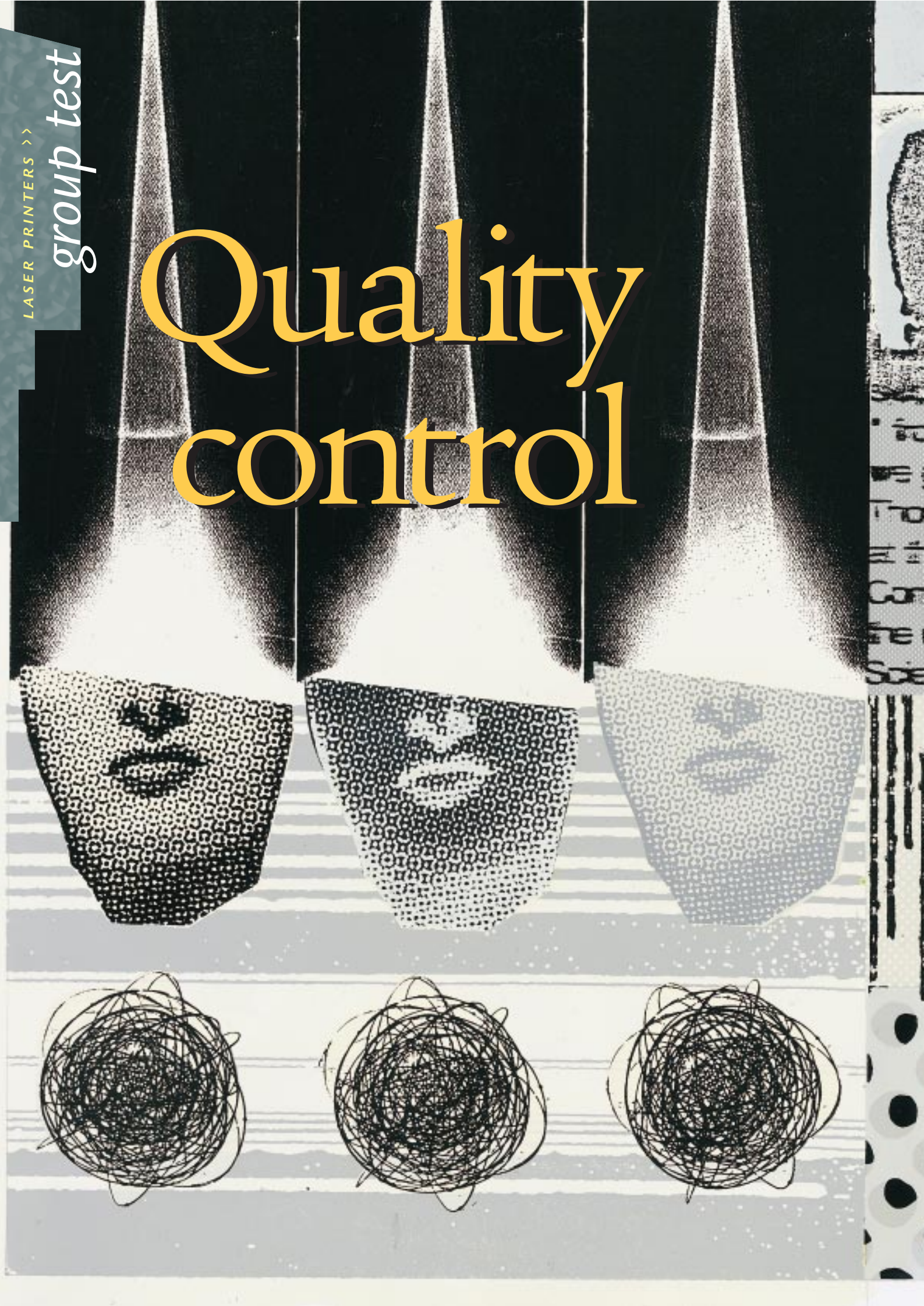
Quality control



Printing

One for the home and one for the office? A good-quality laser printer is no longer beyond your means now that prices have fallen to inkjet levels. We test five personal and ten small-workgroup laser printers.

Laser printer prices have fallen sharply in recent years. Just a few years ago, you would have had to take out a second mortgage to afford a laser printer for your personal use, while network laser printers were the prized possessions of large- and medium-sized businesses. Today, personal laser printers are as cheap and ubiquitous as inkjets, while network printers no longer have to be shared by large departments, but can be owned by small workgroups. Over the past few years, laser printers have lost out to inkjet printers which have improved dramatically in print quality. They are cheap and can print in colour. For printing in mono, though, laser printers beat inkjets in two crucial areas, quality and speed. For those who need professional-looking documents, good quality is a must. In an office environment, where numerous users are connected to the same printer, speed is of the essence. And, laser printers have lower running costs than inkjets because their consumables (paper and toner) are less expensive.

We have tested five personal laser printers with a rated print speed of around six pages per minute (ppm) and ten small workgroup printers rated at between 12 and 16 ppm. Plus, we have taken a look at how laser printers work and the costs associated with running them.

Contents

• *Printers tested and reviewed by Ajith Ram*

Ratings

★★★★★ **Buy while stocks last**
★★★★ **Great buy**
★★★ **Good buy**
★★ **Shop around**
★ **Not recommended**

Illustration by Matt Herring

How laser printers work

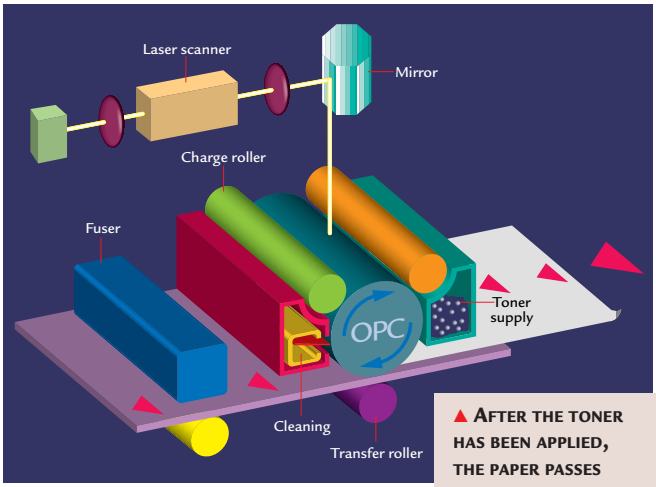
There are two main types of "laser printer": the laser and the LED (light emitting diode) varieties. Both work in much the same way. Each page is converted into a bitmap and stored in memory. A photo- or light-sensitive drum is then charged with static electricity. Each point on the drum relates to a point on the paper, with one line of the image written each time the drum spins. By switching on the light source, whether from a laser or from LEDs, the static charge is knocked off the drum where no toner is required. The toner, attracted to the areas where the charge remains, is picked up by the drum as it turns and is deposited onto the paper below. This then passes under a fuser, which presses the toner onto the page and heats it so it sticks.

Lasers and LEDs

In laser printers, the laser beam is deflected across the width of the drum by a spinning eight-sided mirror which works in conjunction with the laser, switching on and off at high speed to selectively knock the static charge off the drum. By contrast, LEDs are fixed across the width of the drum, providing a more direct light source.

LEDs have two advantages over lasers. Firstly, LED printers do not need to use complex mirrors. Secondly, LEDs are slightly more accurate, particularly at the extreme fringes of the printed page, because, for every dot printed, there is an LED behind it so the accuracy of the printer is not dependent on the correct alignment of complex mirrors. LEDs are not without their disadvantages, though. They have a fixed resolution, decided by the number of LEDs across the page width. So, a printer with 600 LEDs per inch will have a resolution of 600dpi. They also have the reputation of being less effective at halftoning.

With halftoning, you can print continuous tones and shades of grey. Commercial printing presses are incapable of printing *shades* of an ink so rather than printing a black dot or not, halftoning lets you print large dots close together which are perceived as dark shades, while small dots further apart are seen as lighter shades. The implementation of halftoning varies between printers. While some laser printers achieve it by varying the intensity of the light hitting the drum surface, LED printers use a form of interpolation to achieve the same effect.



▲ AFTER THE TONER HAS BEEN APPLIED, THE PAPER PASSES UNDER A FUSER, WHICH HEATS IT. THIS ATTACHES THE TONER FIRMLY TO THE PAPER

Page description language

Personal and network laser printers both share the same means of getting ink onto paper but differ in how they create an image to be printed. Windows and most other common operating systems are now graphical, so although the OS does a certain amount of work in processing the data to display it on the monitor, a great deal of work must still be done to convert it into something the printer can handle. Most personal printers fall into the category of GDI (Graphical Device Interface) or WPS (Windows Printing System). GDI printers scale and rasterise vector shapes. Every GDI printer communicates with the computer via the driver in a unique way. Some GDI printers depend on the host CPU while others have their own print controllers which, although less powerful than those in network printers, take some of the strain off the host CPU.

WPS is based on GDI technology but, as it uses the Windows OS and the host CPU, it standardises the interface with the printer. The advantage over GDI is that it can start to print before the entire page has been rasterised, so reducing the strain on the CPU. As it is a Windows platform, you cannot print from DOS and some claim WPS is not as accurate because it is a generic process which is meant to work across a range of printers.

Network printers typically use one of three page description languages: PostScript, PCL or PrintGear. Adobe PostScript is one of the most popular as it is a device-independent file format. Because it treats images and fonts as geometric objects rather than bitmaps, images can be scaled up or down and will faithfully recreate the original file whether it is on a 600dpi laser printer or a high resolution image-setter. To print PostScript files your printer must have a built-in interpreter.

PrintGear was designed for use in the SoHo market, unlike PostScript which is aimed at large networks and printers. It uses a RISC print controller which processes the most common printing functions faster.

Originally developed by Hewlett-Packard (HP), Printer Control Language (PCL), like PostScript, is a true WYSIWYG format supporting scalable fonts. It is optimised for printing from GUIs like Windows and OS/2, so reducing the commands which need to be processed by the printer. It also provides advanced features like font synthesis which reduces the storage space required for TrueType fonts in the printer's ROM. Non-HP printers may claim PCL compatibility but none handle PCL in exactly the same way as HP versions.

Hardware requirements

While some personal printers make do with less than 2Mb of memory and the host CPU to process the image, network printers need more: typically, internal processors, large amounts of RAM, and RIPs (Raster Image Processors). RIPs are a combination of software, hardware or firmware which convert vector images into bitmaps. A RIP can also handle the network print spooling and queuing. What hardware you need depends largely on the size of your organisation (see "The cost of printing", p212).

Canon LBP 660

Personal

Canon's LBP 660 has a parallel port interface and uses the Windows Printing System (WPS). As a result, the printer does not have its own processor and uses the host PC's CPU to rasterise the image. It also has just 128Kb of RAM — a small amount compared to some of the other 6ppm printers in this test. Moreover, there are no free SIMM slots, so the memory cannot be upgraded. On the plus side, the 660 supports PCL4 emulation in software. The paper input tray is capable of holding up to 100 sheets, with another slot available for manual feeding. This printer is not an easy one to operate. Although driver installation went without a hitch, troubleshooting was a different experience. Much of this has to do with the absence of any indicator lights on the printer, which makes it difficult to tell what exactly the printer is doing. Also, unlike the QMS printer driver, the LBP 660 driver provides no feedback on the printer's status. Text-printing speeds exceeded 4ppm — not bad for a printer rated at 6ppm. Print quality was mixed, but despite the dense black regions showing clear banding and pixellation, its handling of halftoning was disappointing. Text output was excellent.

PCW DETAILS

★★★

Price £257.32 (£219 ex VAT)
Contact Canon 0121 666 6262
www.canon.co.uk
Good Points Fast printing speeds.
Bad Points RAM not upgradeable.
Conclusion Particularly good at graphics.

Kyocera FS 600

Personal

EDITOR'S CHOICE PERSONAL COMPUTER WORLD

The FS 600 is an entry-level printer which would make a good contender in the small-network printer market. It sports a 50MHz PowerPC processor and an ethernet interface as well as the standard enhanced parallel port. It has 4Mb of RAM, upgradeable to 36Mb via a single SIMM slot, and support for HP PCL 5 as standard. Adobe PostScript support is available as an upgrade. This is an impressive spec for a 6ppm printer and should cater for your future home or business network needs. Even the paper input tray is upgradeable, from a 150-sheet tray and manual feeder to a 250-sheet tray. Kyocera claims low usage of consumables due to its ECOSYS technology. As this allows just the toner to be replaced, rather than the entire cartridge, Kyocera states that it lowers costs and makes the printer environmentally friendly. Installation was a breeze and the driver menu is very user friendly. It identifies the interface and provides easy access to settings. The FS 600 claims 6ppm but in our tests it slightly exceeded this while printing text. Its print quality was excellent, particularly in its handling of halftones and fine details.

PCW DETAILS

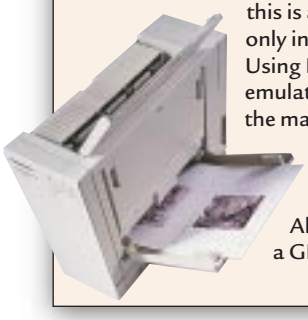
★★★★★

Price £351.33 (£299 ex VAT)
Contact Kyocera 0118 923 0660
www.kyocera.co.uk
Good Points Very upgradeable. Easy installation. Fast printing.
Bad Points Costly.
Conclusion A printer which performs well in all respects.

Panasonic KX-P6300

Personal

The KX-P6300 has a unique shape. It stands upright and looks more like a small tower PC. This design makes its footprint small enough to fit on a crowded desktop. There is 256Kb of RAM which can be increased to 1.25Mb. It has a maximum resolution of 600dpi but this is achievable only in GDI mode. Using PCL 4.5 emulation, the maximum resolution falls to 300dpi. Although it is a GDI laser printer, it does not have its own print controller but depends on the host CPU to rasterise the image. It can handle A4 paper and envelopes of differing sizes. There is one paper-in tray, for both regular and manual feeding, which can hold a maximum of 100 sheets, but due to the printer's unique design there is no space available for an extra in-tray. Setting up the printer was relatively easy but the printing process is not trouble free. Although there are three LED lights on the control panel, their purpose is not immediately apparent. Moreover, several times during our tests the printer stopped, apparently because of insufficient memory. Fortunately, the driver is versatile enough to help you troubleshoot. Print quality was good overall, with good handling of halftones and fine details, although it was let down by flaky ink.



PCW DETAILS

★★★

Price £257.32 (£219 ex VAT)
Contact Panasonic 01344 853081
www.panasonic.co.uk
Good Points Compact size.
Bad Points No extra paper tray. Hiccups while printing.
Conclusion A printer that saves on desk space.

QMS DeskLaser 600

Personal

The DeskLaser 600 has a modest 7MHz Mitsubishi RISC processor and 1Mb of RAM. An enhanced version of the same printer, the 600P, is available with 2Mb RAM and a 16MHz AMD 29202 processor.

The DeskLaser 600 is targeted at Windows users and so, being a WPS (Windows Printing System) printer, you can only print from Windows. Its big brother however, the 600P, uses PCL6 emulation and with this you can print from any OS you choose. The DeskLaser 600 paper input tray is capable of holding up to 100 sheets. It also has a manual feed option. The paper output tray holds just 30 sheets. The QMS printer driver menu is one of the most user-friendly around. Unlike many others, the driver provides detailed feedback about the various stages of the printing process. For instance, if there is a paper jam while printing, it reports it immediately and suggests ways to solve the problem. The menu also provides the option to pause or delete the job in progress. The DeskLaser 600 has a text printing speed of 4.2ppm — not bad for a printer rated as 6ppm. Unfortunately, the output suffered from banding and posterisation.

PCW DETAILS

★★★

Price *£210.33 (£179 ex VAT)*
Contact *QMS 01784 445555*
www.qms.nl
Good Points *User-friendly driver menu. Fast printing speeds.*
Bad Points *RAM not upgradeable. Mediocre print quality.*
Conclusion *A good choice for a personal printer.*

Tally T9006

Personal

This GDI printer is built around a 16MHz AMD processor and has a rated speed of 6ppm. It comes with 2Mb of RAM which can be upgraded to 18Mb by the addition of a single SIMM. It also has ten TrueType fonts stored in ROM. The paper input tray can store 100 sheets and there is provision for manual feed. The T9006 has only a parallel port as an interface — adequate for its purpose as a personal printer but limiting if you want to put it on a small network. It is, literally, one of the hottest printers on the market. For some reason which we could not identify, the front underside of the unit becomes hot within a few minutes. Restarting and leaving the front bay open does not solve this problem. The T9006 is a difficult printer with which to work. Although driver installation went flawlessly, printing was a chore. Quite often the printer would stop while printing a page or would refuse to print the rest, and there was a lack of warning signals. Additionally, it was one of the slowest printers in this group test, with an average text printing speed of only 1.4ppm.

PCW DETAILS

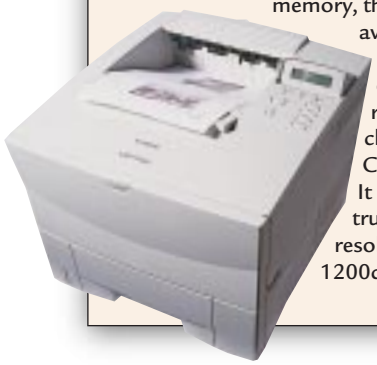
★★

Price *£316.07 (£269 ex VAT)*
Contact *Tally 01895 252131*
www.tally.co.uk
Good Points *Its ability to hold a lot of RAM.*
Bad Points *Slow printing speed. Not easy to troubleshoot. Runs hot.*
Conclusion *Slow. Printing was a chore.*

Canon LBP 1760

Small Workgroups

Sporting a 50MHz Intel processor, the LBP1760 has a rated print speed of 16ppm. Its 4Mb of RAM is expandable to 36Mb with a 32Mb SIMM and its 4Mb ROM can be upgraded with a flash memory module. By compressing data in its memory, the 1760 avoids print over-runs, claims Canon. It has a true 600dpi resolution or 1200dpi at half speed, and an interpolated resolution of 2400dpi. Unlike most laser printers, a ceramic heater is used, rather than a fuser drum, to fix the toner to the page. Canon claims that this leads to faster startup, yet in our tests the ceramic heater provided no advantage. The LBP 1760 has a rated startup time of 25 seconds. In our tests, the warm-up period proved to be at least twice that — longer than most others here. There is a 500-sheet paper input cassette plus a manual feed tray to hold another 100 sheets. A 500-sheet input tray is optional. The printer supports PCL. Text printing speeds were just over 10ppm — well below its rated top speed. Print quality was average. The black regions showed clear banding and the lighter regions appeared partly washed out.



PCW DETAILS

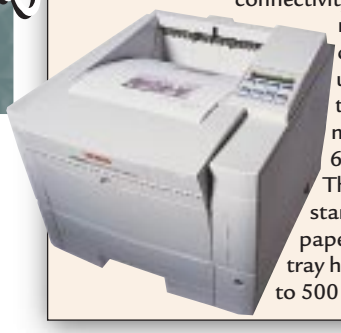
★★

Price *£1,056.32 (£899 ex VAT)*
Contact *Canon 0121 666 6262*
www.canon.co.uk
Good Points *Upgradeable RAM. ROM.*
Bad Points *Average printing speeds. Mediocre print quality.*
Conclusion *A reasonably priced printer let down by poor print quality*

Digital LN15+N

Small Workgroups

This 16ppm printer is the latest addition to the Digital printer line. It is based around a 125MHz MIPS processor and comes in two flavours: the 12Mb LN15+P with a parallel port connection, and the 20Mb 15+N with ethernet connectivity. Both models can be upgraded to a maximum 68Mb. The standard paper input tray holds up to 500 sheets.



The optional second input tray holds 450 sheets. There is also a multifunction feeder capable of holding 100 sheets. The printer's true resolution of 600dpi can be enhanced to 2400dpi through interpolation. It has support for PostScript and PCL 5e as standard, although unusually the drivers for both are not automatically installed. Manually installing them puts two icons under the printer menu. The printer's driver supports all Microsoft operating systems from Windows 3.1, as well as operating systems commonly used on DEC networks, such as Unix. Setting up the Digital printer on a network is easy. It comes with an excellent manual and a CD containing the drivers. The overall print quality, particularly text, was good. It was not so hot on halftoning and print speeds were unexceptional.

PCW DETAILS

★★★

Price *£1,429.98 (£1,217 ex VAT)*
Contact *Genicom 01252 744400*
www.digital.com
Good Points *Powerful processor. PostScript. PCL support.*
Bad Points *Average printing speed.*
Conclusion *A robust printer for small and medium networks.*

Epson EPL-N1200

Small Workgroups

This 12ppm laser printer is one of Epson's small network laser printers in a range which now includes 8ppm to 40ppm mono lasers and even a colour laser printer. Sporting a 20MHz RISC processor, the EPL-N1200 has only 2Mb of RAM but Epson claims this is equivalent to 4Mb due to its MITech process. Physical memory can be increased to 68Mb with the addition of two 32Mb SIMMs. There is a paper input tray capable of holding 250 sheets and two optional, additional trays will each hold 500 sheets. Manual feed is via the standard tray. Support for PCL 5e comes as standard, although PostScript support will cost extra. This printer only has drivers for Windows 3.1, 95/98 and NT. The control panel on the printer itself is a confusing array of arrows and letters, but fortunately, selecting the printer settings through the driver menu is much easier. You can even password protect it. In our tests, the EPL-N1200 had an average speed of over 11ppm but graphics printing speed was less impressive.

The overall print quality was very good with black regions showing little sign of banding, although its handling of halftoning was less impressive.

PCW DETAILS

★★★

Price *£938.83 (£799 ex VAT)*
Contact *Epson 0118 988 2992*
www.epson.co.uk
Good Points *RAM easily upgradeable. PCL support.*
Bad Points *Confusing control panel.*
Conclusion *A network printer which merits consideration.*

Fujitsu PrintPartner 16ADV

Small Workgroups

This is a 16ppm network-ready laser printer with a 125MHz processor from Fujitsu. It comes with a standard 8Mb RAM expandable to 68Mb and there is the option to increase existing ROM by the addition of a flash card. The PrintPartner 16ADV has support for PCL and PostScript. As well as an enhanced parallel port, it also has ethernet connectivity. There is one paper cassette to hold 550 sheets, and another tray for manual feed. Another cassette, with a 500-sheet capacity, is optional. The PrintPartner has a true resolution of 600dpi which can be scaled to 1200dpi using Fujitsu's FEIT image enhancement technology. Installing the printer is easy, although operating it is not quite so straightforward, partly due to the confusing buttons on the control panel. The printer driver menu is easily customisable: it provides one-click access to most functions such as resolution settings, paper size and graphics quality. The printer's text printing speed compared well with its top-rated speed of 16ppm. Overall print quality was excellent, with rich detail in the dark regions and good handling of greyscales. Its text output was equally good, being clearly legible even at small font sizes.

PCW DETAILS

★★★★

Price *£1,321.87 (£1,125 ex VAT)*
Contact *Fujitsu 0181 606 4604*
www.fujitsu-europe.com
Good Points *Support for PCL and PostScript. RAM. ROM is upgradeable.*
Bad Points *Slow while printing graphics.*
Conclusion *A good network printer at an attractive price.*

HP LaserJet 4000TN

Small Workgroups

At 17ppm, the LaserJet 4000TN is one of the fastest printers in this test. It has a powerful 100MHz print controller, and 8Mb of RAM which can be expanded to 100Mb, and an optional 1.4Gb IDE hard drive is available. This drive can be used to hold regularly printed items like forms, signatures and fonts. The driver for this printer makes use of HP's JetSend protocol which lets you hook up a scanner to the printer without having to use a PC to transfer the data. HP has one of the most comprehensive networking software suites on the market. This suite permits remote access to the HP printer and other devices on the network and it constantly monitors the printer's status, informing the administrator of possible problems like low toner. The 4000TN supports HP's own PCL 6 file format and Adobe's PostScript 2 as standard, and due to its powerful processor, it processes PostScript files fast. Text and graphics printing speeds were impressive, too. Overall, the print quality was good, although not as good as some of the other printers in this group. The black regions show slight streaking, and there was some posterisation on the graphics. Overall though, it put up a decent performance.

PCW DETAILS

★★★★

Price *£1,316 (£1,120 ex VAT)*
Contact *Hewlett-Packard 0990 474747* www.hp.com
Good Points *Fast printing. Good print quality.*
Bad Points *Print quality not up to HP's usual standard.*
Conclusion *Excellent speed for a good price.*

Kyocera FS 1700+

Small Workgroups

The FS 1700+, like the 6ppm FS 600 (*p192*), has a PowerPC processor but running at a higher clock speed of 66MHz. It comes with 4Mb of RAM, upgradeable to 68Mb with the addition of two SIMMs. The FS 1700+ uses ECOSYS technology which, says Kyocera, reduces the overall cost of printing. The 1700+ has a true printing resolution of 600dpi, which can be increased to 2400dpi using Kyocera's image refinement technology. Adobe PostScript is supported, as is the latest version of PCL. It also emulates other printers from manufacturers such as IBM and Epson. As befitting a good network printer, it has an ethernet interface and support for popular protocols. It also has an enhanced parallel port for connecting to individual PCs. The standard paper input tray holds up to 250 pages, and in combination with two other optional trays, this capacity can be increased to 850. Driver installation is easy, and the menu provides access to easily configurable printer settings. The networking protocols can also be easily set. Print quality was almost as good as the smaller FS 600. The prints showed excellent detail in the darker regions, with no banding.

PCW DETAILS

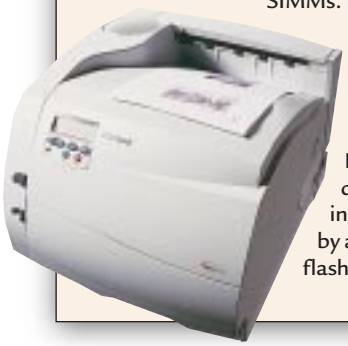
★★★★

Price *£821.32 (£699 ex VAT)*
Contact *Kyocera 0118 931 1500* www.kyocera.co.uk
Good Points *Powerful processor.*
Bad Points *None.*
Conclusion *A good-value printer that is capable of producing high-quality output.*

Lexmark Optra K1220

Small Workgroups

With a print speed rated at 12ppm, the K1220 is aimed primarily at small businesses. Built around a 33MHz Intel processor, this laser printer comes with only a standard 2Mb of memory but this is expandable to 66Mb using two extra SIMMs. It also has an optional internal print server. ROM can be increased by adding a flash memory module. The K1220 has a true resolution of 600dpi (1200dpi interpolated). Lexmark claims its two-part toner and drum system reduces the print cost per page. The paper input tray holds 200 sheets and there is a separate single-sheet manual feeder as standard. There's an optional input tray to hold a further 450 sheets and a 90-sheet multi-purpose feeder, too. PCL 6 (latest version) and Adobe PostScript 2 are supported as standard and the printer is compatible with major networks. With text printing speeds exceeding 10ppm, the K1220 is a good contender in the small-network printer market. Graphics printing speeds did not exceed 7ppm but the quality of printed text was excellent and the graphics were the best we saw in this test.



HIGHLY COMMENDED
PERSONAL COMPUTER WORLD

PCW DETAILS

★★★★

Price *£722.63 (£615 ex VAT)*
Contact *Lexmark 01628 481500* www.lexmark.co.uk
Good Points *Upgradeable RAM. Hard drive.*
Bad Points *Nothing drastic.*
Conclusion *Good value network printer.*

Minolta PagePro 12

Small Workgroups

Housing a powerful 100MHz print controller, the PagePro 12 has 4Mb of RAM which can be increased to 36Mb by the addition of a SIMM. Support for PCL 5e is standard, while PostScript 2 support is optional. The printer has a parallel port with ethernet as an option and there is support for common networking protocols such as Ethertalk and TCP/IP.

A true 600dpi printer, the PagePro can increase the resolution to 1,200dpi through interpolation. It comes with exhaustive documentation which delves into the finer aspects of setting up a network printer as well as proper operating procedures which could affect power consumption and toner usage. The driver interface is equally useful. Dotted with large icons, it provides easy access to the most common settings. Minolta rates the PagePro's speed at 12ppm — text printing speed proved to be comfortably close to this at nearly 11ppm. However, while printing graphics, the PagePro's output rate fell dramatically. The overall print quality was above average, although there was a little pixellation in the darker regions and occasional banding. This was particularly true of printed graphics.

PCW DETAILS

★★★

Price *£870.67 (£741 ex VAT)*
Contact *Minolta 01908 200400*
www.minolta.com
Good Points *Powerful print controller. Good documentation.*
Bad Points *Very slow while printing graphics.*
Conclusion *A network printer offering good text quality.*

QMS DeskLaser 1600P

Small Workgroups

The DeskLaser 1600P has a powerful RISC processor, as befits a 16ppm network printer. The 125MHz controller is powerful enough to churn through most difficult printing jobs, particularly while handling processor-heavy duties like printing PostScript files. It has 12Mb of memory, upgradeable to 68Mb (users must buy this extra memory from QMS).

At present, the 1600P is able to operate only from Windows 95, NT or Mac environments (there is no Unix support). The printer supports PCL 6 and PostScript 2, although network support is an optional extra on the base model. The paper input tray is capable of holding 500 sheets. An optional, additional tray will also hold 500 pages. There is a manual feeder, too. Setting up the 1600P on a network is painless. It comes with an excellent manual and an installation CD with the necessary drivers and utilities. The 1600P's menu provides the useful facility of being able to configure settings from the driver menu — great for system administrators. A fast print speed produced over 12ppm and gave excellent results with rich blacks and good handling of halftones.

HIGHLY COMMENDED PERSONAL COMPUTER WORLD

PCW DETAILS

★★★

Price *£816.63 (£695 ex VAT)*
Contact *QMS 01784 445555*
www.qms.nl
Good Points *Easy installation. Good quality output.*
Bad Points *No support for Unix.*
Conclusion *A good network printer with acceptable speed.*

Xerox DocuPrint N17

Small Workgroups

Built around a 66MHz processor from Intel, the DocuPrint N17 has 16Mb of RAM expandable to 64Mb. The N17 uses Xerox' WorkSet technology, which has a Send Once, RIP Once, Print Many capability: it holds print commands at the printer rather than on the network, ensuring that documents of which you want more than one printed copy are processed only once. Additionally, one page can be printed while the next is being processed. The comprehensive network management suite includes the CentreWare Internet Services package enabling remote management of the printer, and PrinterMap which provides access to all network printers regardless of manufacturer. It has built-in support for PCL 5e and is one of the few network printers to support Adobe PostScript Level 3. The paper cassette holds 250 sheets, with a 100-sheet bypass feeder. The upgrade option from Xerox is the siae of a filing cabinet with a paper feeder capable of holding 2,500 sheets, taking the full paper capacity to 2,850 sheets. Also, unlike many other printers, the duplex module comes as standard.

The DocuPrint N17 produced an average text printing speed of just over 14ppm, but the graphics printing speed was less than half this. Overall print quality was good.

PCW DETAILS

★★★

Price *£1,004.63 (£855 ex VAT)*
Contact *Xerox 0800 632642*
www.xerox.co.uk
Good Points *Powerful processor. Good network management software.*
Bad Points *Average graphics speed.*
Conclusion *A good choice for those printing large numbers of documents.*

Table of features




Manufacturer	Canon	Kyocera	Panasonic	QMS	Tally
Model	LBP 660	FS600	KX-P6300	DeskLaser 600	T9006
Price (ex VAT)	£219	£299	£219	£179	£269
Contact	0121 666 6262	0118 923 0660	01344 853 081	01784 445555	01895 252131
URL	www.canon.co.uk	www.kyocera.co.uk	www.panasonic.co.uk	www.qms.nl	www.tally.co.uk
Rated print speed	6ppm	6ppm	6ppm	6ppm	6ppm
Print controller	✗	50MHz PowerPC	25MHz RISC	7MHz Mitsubishi	16MHz AMD
RAM/max RAM	128Kb / 128Kb	4Mb / 36Mb	256Kb / 1.25Mb	1Mb / 2Mb	2Mb / 18Mb
Paper tray (in/out)	100 / 50	150 / 100	100 / 50	100 / 30	100 / 30
Optional tray capacity	✗	250	✗	✗	✗
PostScript/PCL	✓ / ✗	✓ / Optional	✓ / ✗	✗ / ✗	✗ / ✗
Optimal resolution/interpolated	600 / 600	600 / 1200	600 / 600	600 / 600	600 / 600





Manufacturer	Canon	Digital	Epson	Fujitsu	Hewlett-Packard
Model	LBP 1760	LN15+N	EPL-N1200	PrintPartner 16ADV	LaserJet 4000TN
Price (ex VAT)	£899	£1,217	£799	£1,125	£1,120
Contact	0121 666 6262	01252 744400	0118 988 2992	0181 606 4604	0990 474747
URL	www.canon.co.uk	www.digital.com	www.epson.co.uk	www.fujitsu-europe.com	www.hp.com
Rated print speed	16ppm	16ppm	12ppm	16ppm	17ppm
Print controller	50MHz Intel	125MHz MIPS	20MHz RISC	125MHz Fujitsu	100MHz RISC
RAM/max RAM	4Mb / 36Mb	20Mb / 68Mb	2Mb / 68Mb	8Mb / 68Mb	8Mb / 72Mb
Paper tray (in/out)	500 / 250	500 / 250	250 / 350	550 / 250	600 / 250
Optional tray capacity	500	450	1000	500	575
PostScript/PCL	Optional / ✓	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
Optimal resolution/interpolated	600 / 2400	600 / 2400	600 / 1200	600 / 1200	600 / 1200



Manufacturer	Kyocera	Lexmark	Minolta	QMS	Xerox
Model	FS 1700+	Optra K1220	PagePro 12	DeskLaser 1600P	DocuPrint N17
Price (ex VAT)	£699	£615	£741	£695	£855
Contact	0118 931 1500	01628 481500	01908 200400	01784 445555	0800 632642
URL	www.kyocera.co.uk	www.lexmark.co.uk	www.minolta.com	www.qms.nl	www.xerox.co.uk
Rated print speed	12ppm	12ppm	12ppm	16ppm	17ppm
Print controller	66MHz PowerPC	33MHz Intel	100MHz RISC	125MHz RISC	66MHz Intel
RAM/max RAM	4Mb / 68Mb	2Mb / 66Mb	4Mb / 36Mb	12Mb / 68Mb	16Mb / 64Mb
Paper tray (in/out)	250 / 250	200 / 200	500 / 250	500 / 250	250 / 250
Optional tray capacity	250	450	500	500	2500
PostScript/PCL	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓	✓ / ✓
Optimal resolution/interpolated	600 / 1200	600 / 1200	600 / 600	600 / 2400	600 / 1200

The quick brown fox jumped over the lazy dogs back. = 1 pt

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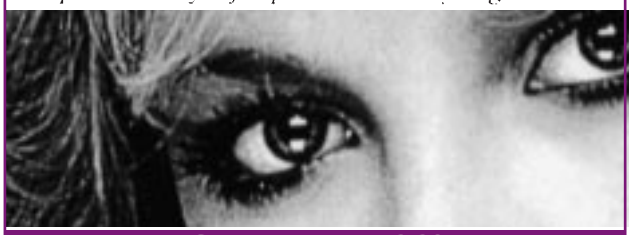

Canon LBP 660

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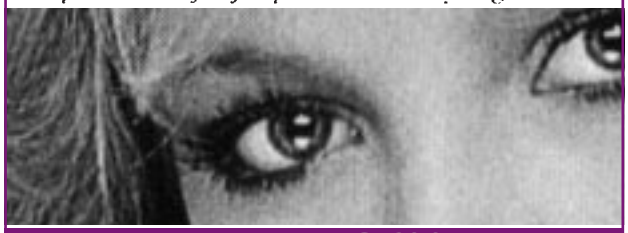

Kyocera FS 600

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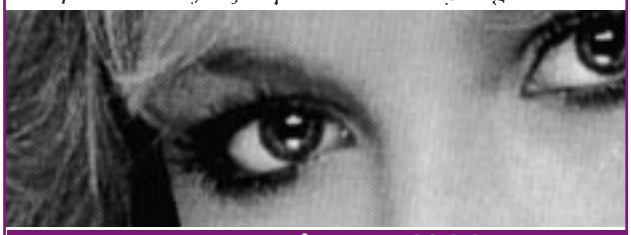

Panasonic KX-6300

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QMS DeskLaser 600

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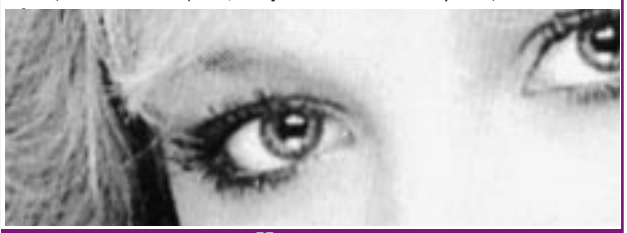

Tally T9006

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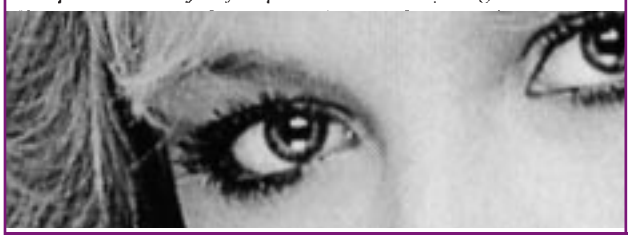

Canon LBP 1760

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Digital LN15+N

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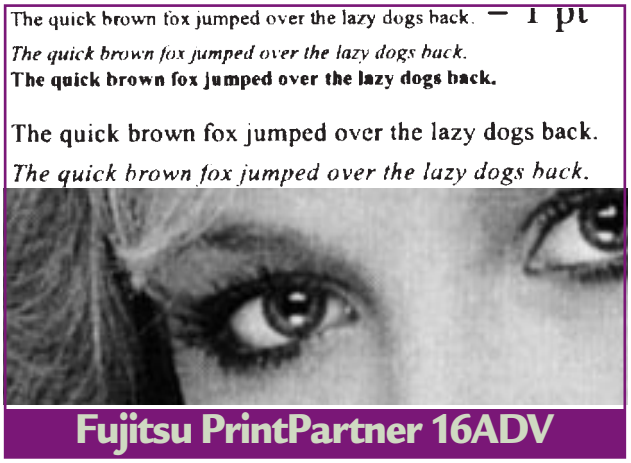
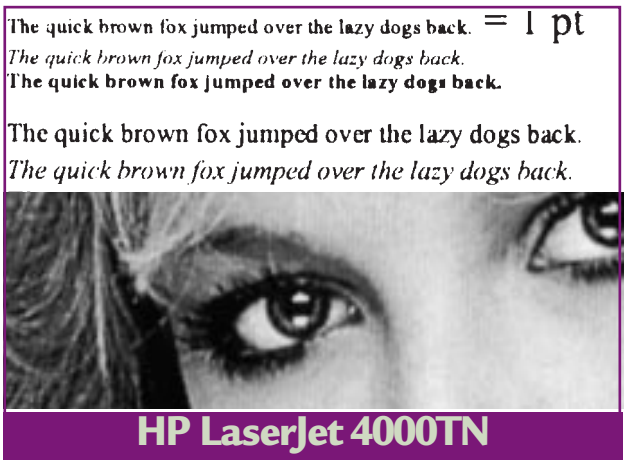
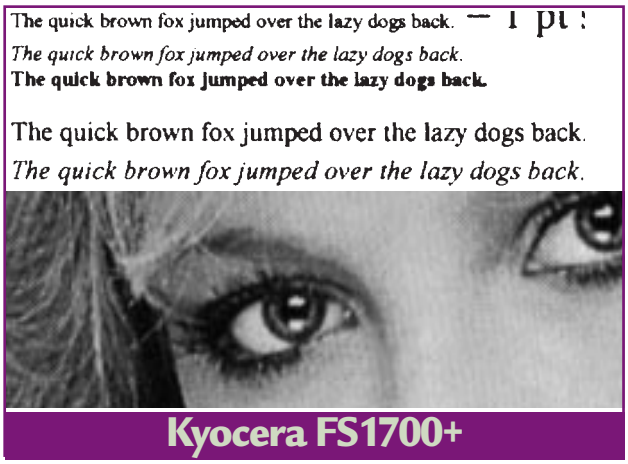
Epson EPL-N1200



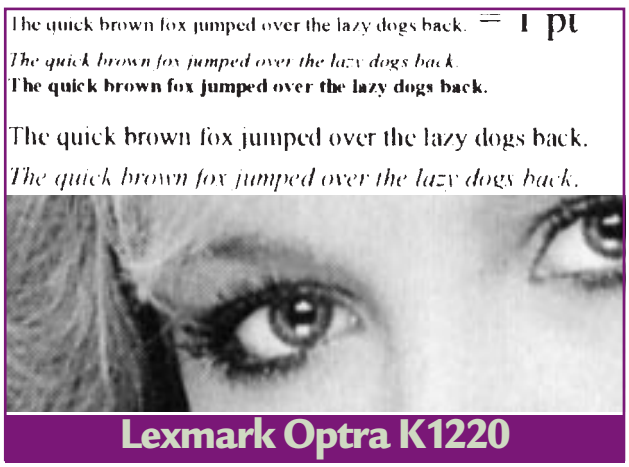
Fujitsu PrintPartner 16ADV



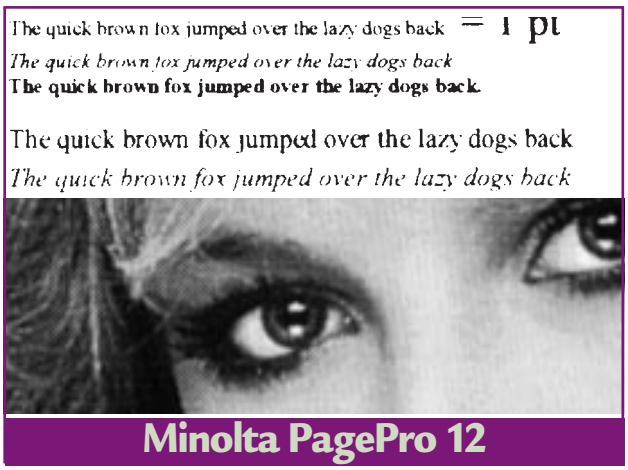
HP LaserJet 4000TN



Kyocera FS1700+

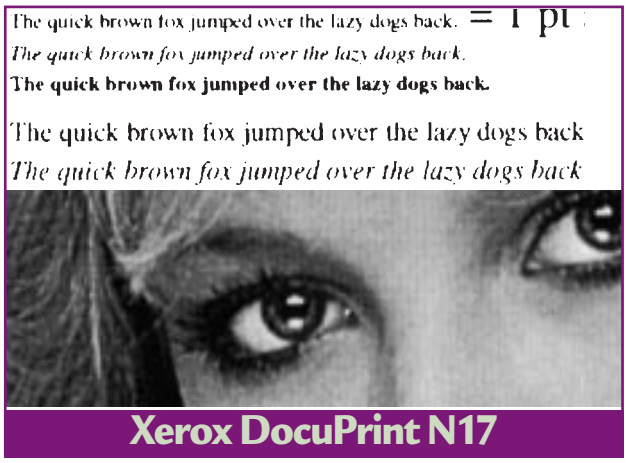


Lexmark Optra K1220



Minolta PagePro 12

QMS DeskLaser1600P



Xerox DocuPrint N17

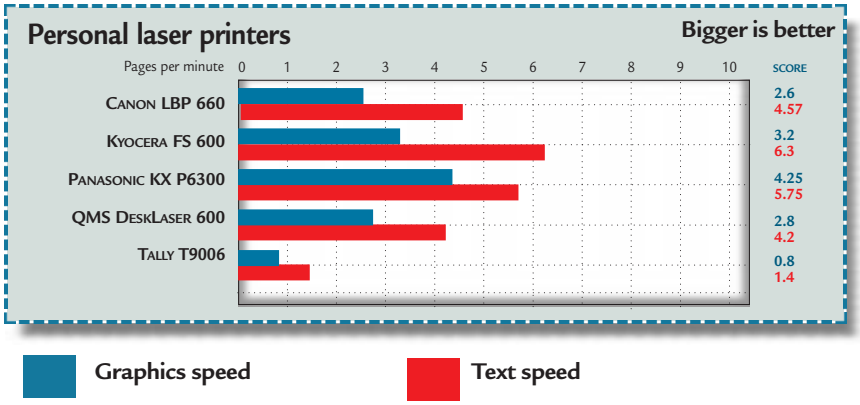
Printer output tests

In our printer output trials, we ran a series of tests which covered every aspect of the printers' output. We have reproduced those results [above] which we feel are most apt: that is, text and graphics output.

In the text test we were looking mostly for legibility when printing very small font sizes. The more accurate the output at these sizes, the better it will print in larger text sizes.

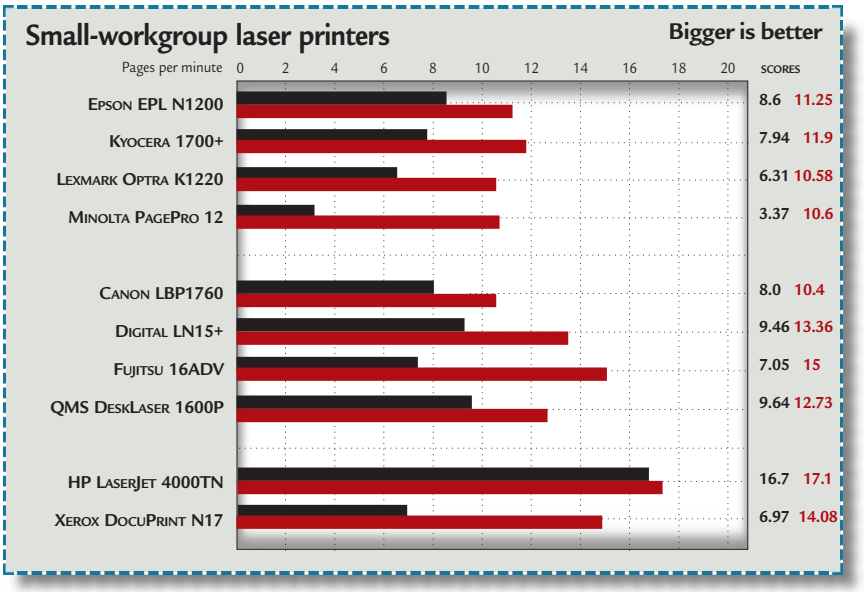
In the graphics part of the test, we were looking to see how each printer coped with fine detail and shading, known as halftoning, especially in the lighter areas. We marked down those printers that created streaky or checked (posterised) output on the photograph, or which misjudged greyscales or coped badly with very light areas.

PCW Labs Report



More than anything else, the results of the personal laser printer part of our tests show just how exaggerated some manufacturers' claims are. All the printers in this section have a rated speed of 6ppm when outputting text, although this is usually based on a coverage of just five percent. However, two printers, the Kyocera FS 600 and the Panasonic KX P6300, were both able to achieve around six pages per minute in our trials.

We divided the small-workgroup printers into three groups of differently rated speeds. The first four are rated as 12ppm printers, the next four as 16ppm and the final two as 17ppm. These tests highlighted the casual abandon with which some companies rate their printers. In our trials, the Canon LBP1760, a 16ppm printer, was slower than the 12ppm printers! Also note the speed at which graphics were printed. We had expected our full-page photo to take much longer to print than text, yet some printers handled graphics considerably better than others. Compare, say, the results of the Epson with a graphics score of 8.6ppm, and the Minolta Page which rated just 3.37ppm.



How we did the tests

We tested the laser printers on a PII 400 with 64Mb of RAM. The tests are intended to judge the print speed and quality for both graphics and text. To assess the speed of text output we printed out a standard ten-page document on the personal printers, and a 20-page document on the small-workgroup printers, then repeated the process three times to get an average page-per-minute score.

☛ **To test the speed** of graphics output we printed a 1Mb graphics file ten times on the personal printers and 20 times on the small-workgroup printers, measuring the time taken to produce the first page and then all the pages, again averaging out the scores to give us a pages-per-minute rate.

☛ **To assess** a small-workgroup printer's PostScript capability and the speed of its internal processor, we used a relatively large 380Kb fractal. This forced the printer to do all the calculations using its own processor rather than the host CPU.

☛ **We used other tests** for quality. These looked for things such as ugly streaks, or banding, when printing large areas of dense black, and took into account the quality of output when using halftoning.

☛ **The small-workgroup** printers were also tested for their ease of setup, networking support and the versatility of their networking software. Additionally, the drivers of both personal and small-workgroup printers were carefully scrutinised, the very light shades in particular. In the graphics test we were looking for how each printer resolved fine detail and whether it created posterised output, with visible horizontal and vertical lines. In the text quality test we looked for sharp edges and legibility, even at very small point sizes.

Editor's Choice

We were very impressed by most of these laser printers. The quality of output overall was very good, although some showed signs of specific strengths and weaknesses. We were also judging speed, upgradeability and price.

In addition to our winners, a couple of contenders should be mentioned in dispatches. For its raw speed, the HP LaserJet 4000TN should be praised: it really can produce the 17ppm it promises. Similarly, the Fujitsu PrintPartner 16ADV should be recognised for its speed and excellent graphics output, and the Kyocera FS 1700+ is inexpensive, fast and produced excellent graphics output.

Three printers stood out from the crowd, though. The **QMS DeskLaser 1600P** is **Highly Commended** for its speed and output but mostly for its very attractive price, far cheaper than any of the other 16ppm printers.

◀ [LEFT] THE QMS DESKLASER 1600P
[FAR LEFT] THE LEXMARK OPTRA K1220

▲ THE KYOCERA FS600

The **Lexmark Optra K1220** is also **Highly Commended**. Not only is it good value for money, but its quality of output was second to none.

Our **Editor's Choice** is a 6ppm model, the **Kyocera FS 600**. It is the most expensive of the personal printers in this group, but you get what you pay for and its output and speed are well worth the extra. It is also easily upgradeable, taking an impressive 36Mb of RAM, and it has a processor as fast as some of those in 12ppm printers.

The cost of printing

There are several factors to consider when preparing to buy a printer: quality, speed and cost. The last is a complicated one to work out, though. The printer's upkeep costs as well as your initial outlay should be taken into account.

All printers, whether inkjet or laser, personal or network, chew their way through a lot of ink and paper during their lifetime. While lasers do not need the same high quality of paper as inkjets, good-quality paper will nonetheless make a difference to the output. Eighty-gram laser paper will cost you around £3 for 500 sheets, while smoother 90g paper, which will give a better finish, will cost around £5 for 500 sheets.

The greatest expense, though, is replacing the toner cartridge. Although one cartridge lasts for thousands of pages, the outlay may be anywhere between £10 and £200 depending on whether the cartridge can be refilled or whether the whole unit must be replaced. Toner cartridges can be recycled, thus reducing their not insignificant environmental impact, but recycled units vary in quality and some manufacturers recommend you do not use them.

While it was common a few years ago to have to replace the printer drum at the same time as the toner cartridge, this is less common in recent printers. Prices vary greatly, so do check the adverts to see exactly how much it will cost to replace various components.

Networking the printer can also add to the cost. Some network printers do not come with a network card as standard, instead providing it as an option. This adds to the overall cost but does ensure you get the right connection for your network setup.

If your printer is to be shared between users or departments, you should work out what speed of printer you need. As a general rule, the more users you have sharing a printer, the faster the print speed that will be required. However, print speed requirements also depend on the type of output — text or graphics. In a workgroup such as the *PCW* editorial office, our 24ppm A4 mono laser is probably over-specified for ten writers who rarely print anything. However, our art and production team also use the A4 mono laser for printing some of their proofs and the extra speed is needed when 12 graphics-heavy pages of a group test are spooled to the printer.

Think carefully about the amount of RAM needed in the printer. Add more for large, graphics-intensive work. You will also need to leave room in the SIMMs to add more RAM at a later date, especially if your needs are likely to change — for example, company expansion. Although you will be stuck with the motor and thus the print speed, you can add more RAM or even a network connection to some of the personal printers in this group test.