

# BUSINESS INKJET TECHNOLOGY

**EPSON®**  
EXCEED YOUR VISION



**Cost Efficiency • Versatility • High performance**

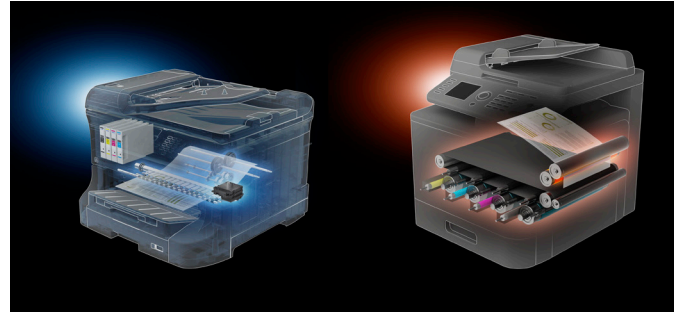
The Epson business inkjet printer realizes higher image quality at faster speed thanks to unique PrecisionCore printhead technology. The efficient printing mechanism reduces waste, costs, and the environmental load. And outstanding versatility supports a wide range of needs to make it the obvious choice for all workplaces, from general company offices to hotels, banks, pharmacies and shops.



PRECISION**CORE**

# The Office Printer Reinvented

Epson has finely analyzed the requirements of business printers in view of changing office needs. By optimally designing our unique printhead technology for business applications and conducting repeated improvements, we have developed a new generation of business inkjet printers to rival or surpass laser printers. There is an established image of laser printers being for business use and inkjet printers being for the home. However, the efficiently simple printing process and mechanism of inkjet printers actually provides a variety of advantages over laser printers. Their high potential also allows for a wide range of applications, and in many commercial and industrial printing segments where precision, productivity and stability are mission critical, inkjet technology is rapidly becoming the industry standard as it evolves. The new office printers developed

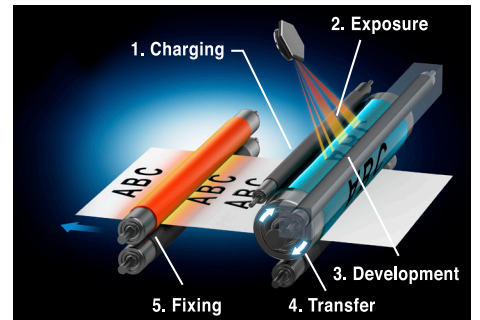
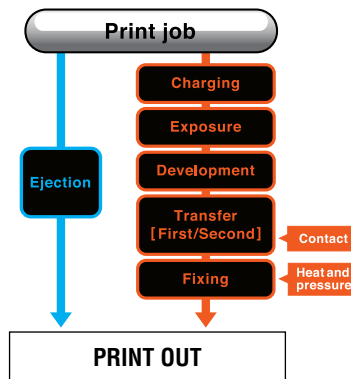
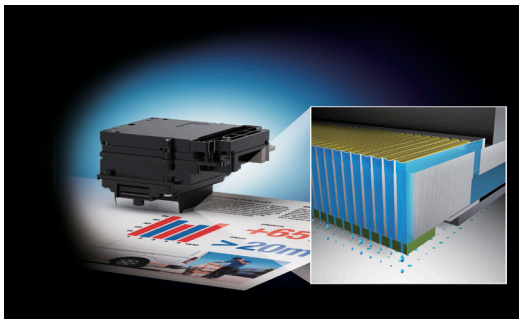


by Epson with PrecisionCore technology take full advantage of the superior capabilities of inkjet technology. In order to meet with the demands of business they also feature uncompromising levels of standard performance. From laser to business inkjet. Epson's evolving inkjet technology will revolutionize office printing.

## Business Inkjet

VS

## Laser



For illustrative purposes only

### Simple mechanism



### Complex mechanism

The simple underlying principle of inkjet printers is the “ejection” of ink from the printhead onto the paper.

Laser printers, however, combine numerous processes such as charging, exposure, development, transfer, and fixing. As a result, they comprise various interdependent parts in a complex mechanism.

### Uses no heat



### Uses heat

Epson inkjet printers adopt the piezo system of using precisely controlled mechanical pressure to eject ink. In laser printers, high-temperature heating is required to fix toner onto paper.

### No contact with paper



### Contact with paper

Inkjet printers eject liquid ink, and require no contact between printhead and paper. In laser printers, powdered ink (toner) attached to the photoreceptor drum is transferred by being brought into contact with the paper.

### Liquid ink



### Powdered ink (Toner)

Inkjet printers use liquid ink for printing. The ejected color materials hold fast to the paper. The toner used in laser printers is powdered ink. To stop the powder from dropping off the paper following transfer, heat and pressure are used to fuse it. Also, the space between the powder ink particles includes air, so the toner takes up a greater volume than liquid ink.

*“An elegantly simple mechanism, and printing without heating or contact – these unique features enable inkjet technology to deliver performance beyond just high speed and high image quality printing.”*

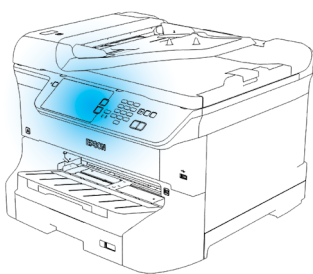
# Cost Efficiency • Versatility • High performance

*“The cost of a printer is far more than just the purchase price of the unit itself. Over and above the easily visible costs, such as ink cartridges and power, other factors can also be considered as part of the total cost. These hidden costs include the replacement parts and service support required in order to use and maintain the printer over a long period, the time and effort required in order to perform that maintenance, and office downtime during periods when printing can’t be performed. Business inkjet printers are excellent at reducing both the costs you can see and those you can’t, making a significant contribution to an overall reduction of printing related costs. The reduction in energy and resources consumption provided as a result is also environmentally considerate.”*

## Less Maintenance and Less Downtime

Compared to laser printers, inkjets have a simpler mechanism, have fewer periodic replacement parts, and so require less time and effort to maintain.

### Business Inkjet



Ink cartridges

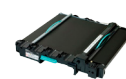
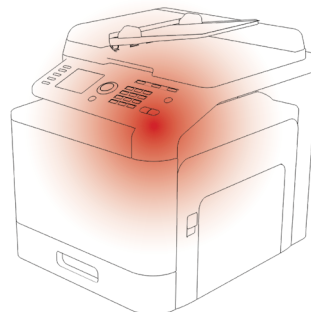


Paper pick-up rollers



Maintenance box

### Laser



First transfer unit



Toner cartridge x 4 colors



Toner cartridge x 4 colors



Development unit



Second transfer unit



Waste toner box



Fixing unit



Paper pick-up rollers

## The Business Inkjet Difference

Inkjet printers have an extremely simple structure for ejecting ink from the printhead onto the paper, with only three parts that require periodic replacement: the ink cartridges, maintenance box, and paper pick-up rollers\*. These can be replaced quickly, so printer maintenance time and hassle is reduced, and office downtime minimized.

### Laser Printers

Because of the multi-step printing process mechanism used in laser printers, not only is it necessary to replace the toner cartridges, but also the photoreceptor, developing unit, transfer unit, and fusing units. Moreover, because the replacement intervals for these components are different, maintenance needs to be performed frequently.



It is easy to replace consumables by simply pushing the empty ink cartridge, pulling it out, then installing a new one (Push&Push).

# Minimizing Hassle and Cost with High Capacity Ink Packs

Epson has developed new high-capacity ink packs for business use. By reducing replacement frequency, operating efficiency and cost performance are increased.

## Business Inkjet

**Ink Pack X 4**



## Laser

**Toner Cartridge X 52<sup>\*1</sup>**



The number of ink packs and toner cartridges required to print 75,000 pages

The newly developed high-capacity replaceable ink pack system can print up to 75,000 pages\*2 without replacing the ink.

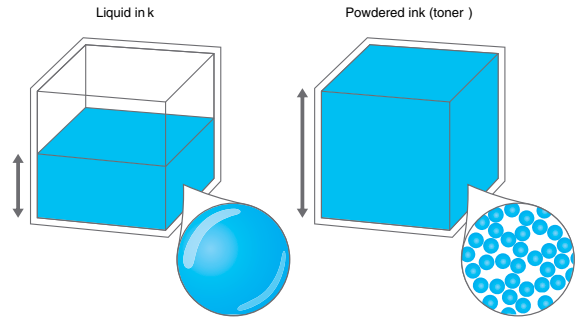
\*1 The number of toner cartridges used to print the same number of pages with the Epson LP-M5300FZ, a color laser MFP. Actual number of toner cartridges required varies by model.

\*2 Quoted yields are extrapolated based on Epson original methodology from the print simulation of test patterns provided in ISO/IEC24712.

Quoted yields are not based on ISO/IEC24711. Quoted yields may vary depending on the images that you are printing, the paper type that you are using, the frequency of your prints and environmental conditions such as temperature.

## The Business Inkjet Difference

The volume of liquid ink required to print the same image is less than half that of powdered ink. This translates into smaller and fewer cartridges. Moreover, Epson has designed a new ink pack suited to heavy duty business use, enabling a greater quantity of ink to be equipped while preserving quality. The replacement frequency of consumables is dramatically reduced, leading to big savings in maintenance costs. Waste is also minimized.



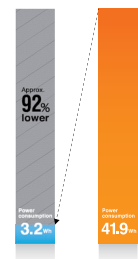
## Laser Printers

The toner used by laser printers takes up more than twice as much volume as the inkjet liquid ink required to print the same image. This difference is further accentuated when the toner is placed in cartridges. This results in toner cartridges requiring more frequent replacement.

## Low Power Consumption, Low Running Cost

Because inkjet printers use no heat in the printing process, they consume far less power than laser printers, which in turn reduces the running cost.

## Business Inkjet



## Laser



## The Business Inkjet Difference

The energy-saving design, made possible by Epson's piezo printheads, generates no heat. Inkjets thus contribute to limiting the unseen energy costs and environmental burden of everyday office operations.

## Laser Printers

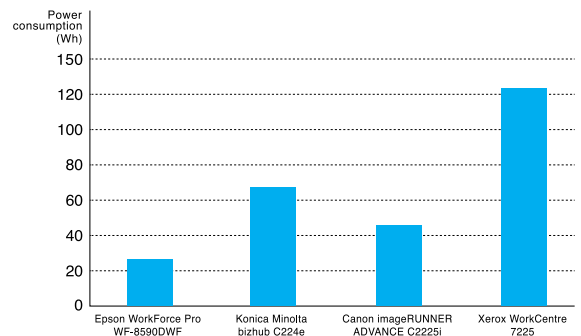
During the printing process, laser printers use a lot of power in heating toner and fusing ink. In particular, when resuming operation from the standby mode, the fusing unit must be heated to operating temperature. In offices that conduct intermittent printing of numerous small volume jobs, repeated warming up from standby mode leads to higher power consumption.

### Comparison of power consumption

Power consumption used for 5 minutes printing

Printing pattern : ISO24734 pattern

Test data is from a lab test commissioned by Epson and conducted by Buyers Laboratory LLC (BLI).



Devices were tested in default mode and per BLI's proprietary standard energy consumption test methods.

Weekday Energy Use = 2 x 4 hour BLI energy testing workload printing + 16 hours sleep.

Weekend Energy use = 48 hours sleep.

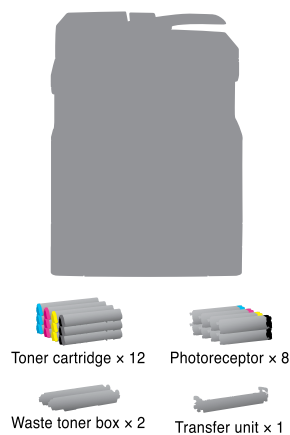
BLI workload test pattern (submitted 6 times over 4 hour period) : comprising, .doc, .xls, .ppt, .pdf, .html and outlook total 19 pages in simplex and duplex. Test data is from a lab test commissioned by Epson and conducted by Buyers Laboratory LLC (BLI).

# Reducing CO<sub>2</sub> Emissions and Environmental Load through Energy and Resource Efficiency

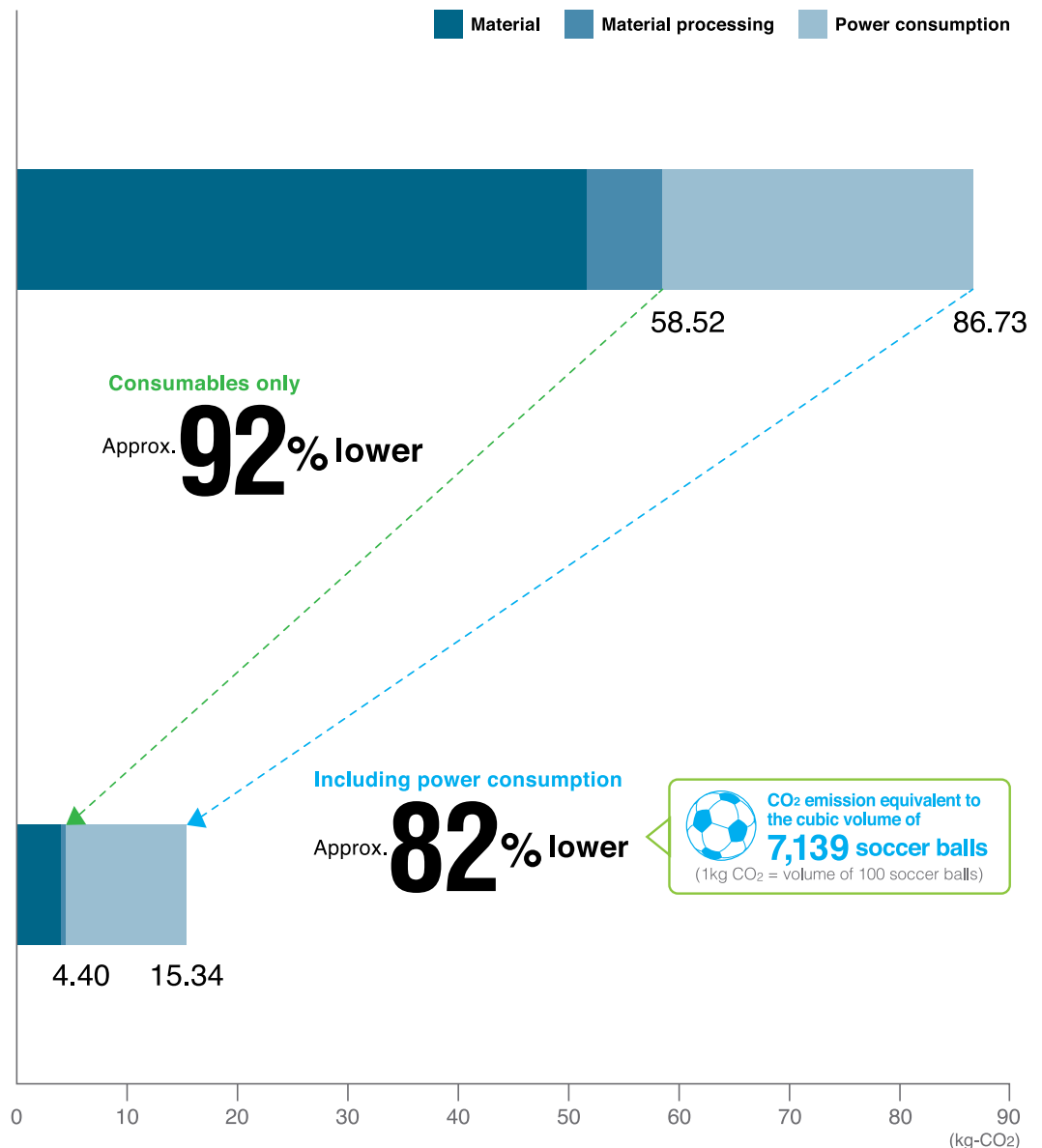
Low power consumption and the minimization of waste with high-capacity ink packs not only reduce costs, but also contribute to reducing environmental load. When evaluating the impact of materials and manufacturing and use, the CO<sub>2</sub> emissions of Epson's business inkjets are considerably lower than those of lasers, demonstrating their environmental performance.

Comparison of Global Warming Impacts (CO<sub>2</sub> equivalent)

## Laser



## Business Inkjet



The 75,000-page<sup>\*1</sup> yield of the color ink pack of the WF-R8590 series was used as the basis for comparing consumables<sup>\*2</sup> and power consumption<sup>\*3</sup> for the Laser printer used in this comparison test.

Figures calculated under Epson's test conditions. Epson uses a life cycle assessment to calculate the total global warming impacts of consumables (material, material processing) and power consumption as CO<sub>2</sub> emissions. For the laser printer compared, consumable environmental impacts, the material of components and material manufacturing method was estimated and calculated based on Epson original criteria and calculation method.

\*1 Quoted yields are extrapolated based on Epson original methodology from the print simulation of test patterns provided in ISO/IEC 24712. Quoted yields are not based on ISO/IEC24711. Quoted yields may vary depending on the images that you are printing, the paper type that you are using, the frequency of your prints and environmental conditions such as temperature.

\*2 WF-R8590 series : Ink pack, Maintenance tank. Laser printer : Toner cartridge, Photoreceptor, Waste toner box, Transfer unit

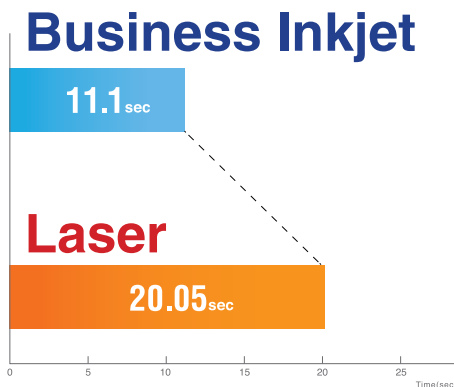
\*3 Power consumption in case of printing 75,000 pages is calculated from TEC value of the ENERGY STAR®. WF-R8590DTWF was measured in the condition of printing 288 pages per day based on TEC standard. Refer the TEC value for Laser printer that has been registered on ENERGY STAR data base as of May 2015. Power consumption and CO<sub>2</sub> emissions will vary depending on customer printer use.

# Cost Efficiency • Versatility • High performance

*“The nature of business is constantly changing with the times. This means that the printing environment and demands directly related to daily business are also diversifying, and printers need to be able to respond to a wide range of requirements. For example, take printing speed. Pure speed is one factor; in terms of how many sheets a printer can print in a minute, but offices with a demand for a large number of small print jobs also require a different kind of speed; how quickly the printer can print the first sheet. Furthermore, there is an increasing demand to print a wide variety of content on demand and in a timely fashion, going beyond business documents and expanding the range of printing beyond the requirements of the past. Our newly developed business inkjet printers are highly versatile, flexibly meeting these varying business needs.”*

## Rapid First Page Printing

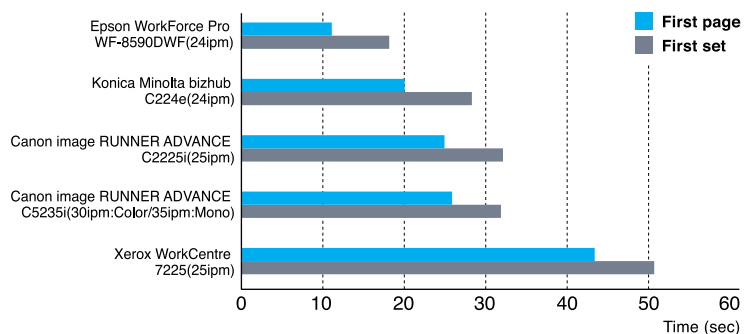
Business inkjets require no warm-up time because they use no heat in printing, so rapid printing is possible from the first sheet.



### First page out time comparison

First page out time of WorkForce Pro WF-8590DWF is about 11 seconds, approximately half that of a comparative laser model.

### Print speed comparison



Measuring method: Time taken to print and deliver the first page and first set after 5 minute sleep  
Document used: ISO 24734 (PDF file)  
Number of pages: 4  
Test data is from a lab test commissioned by Epson and conducted by Buyers Laboratory LLC (BLI).

## The Business Inkjet Difference

Epson's piezo technology uses pressure to eject the ink. There is no need to preheat the fixing unit as in the case of laser printers, so warm-up time can be eliminated. As a result, operation can be resumed from standby much quicker, and rapid printing can be performed from the first sheet. Inkjets display especially high performance in offices that conduct frequent small volume printing jobs.

## Laser Printers

Because laser printers use heat to fix toner to paper, they need warm-up time to accumulate heat in the fusing unit when they are switched on. Moreover, because laser printers process image data in units of pages, they cannot start printing until a page of data has been processed. Accordingly, more time is taken between issuing a printing order and producing the first sheet.

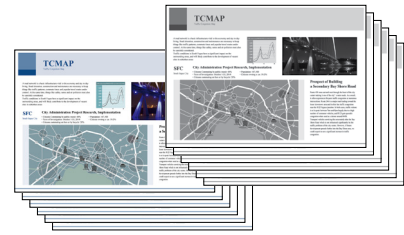
# Diverse Media Compatibility for a Wider Range of Applications

With the flexibility to print on a diverse range of paper types, business inkjet printers can support a wide variety of business needs.

## Business Inkjet



## Laser



## The Business Inkjet Difference

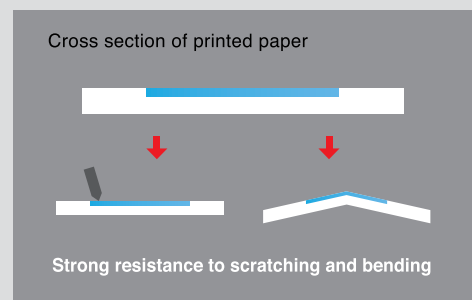
The greatest differentiating feature of piezo inkjet printers is that they use no heat and do not come into contact with media. Because ink is directly ejected onto the paper, it is possible to print even on specialized types of media, including heat-sensitive film, thick card, and special dimpled paper. Moreover, because Epson's business inkjet printers use water-insoluble and marker-resistant pigment-based ink for all colors, they can be used in a variety of business applications, from printing of plain paper to production of waterproof labels and large-size promotional materials on glossy paper.

## Laser Printers

In laser printers, the toner that is attached to the photoreceptor by static electricity is fused onto paper by heat and pressure. As a result, the paper sometimes becomes creased and warped during the fusing.

### Tamper-proofing

Liquid ink from inkjet printers is directly fired onto the paper and firmly adheres to the surface. Moreover, because the ink partially penetrates the paper fibers, the ink doesn't fade or come off over time and documents cannot be tampered with. Therefore, inkjets are more suited for printing and saving important documents.



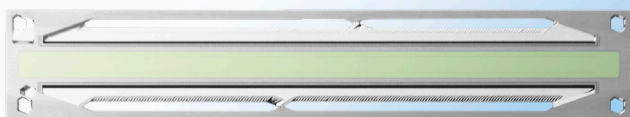
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# PrecisionCore Printhead Technology

PrecisionCore is Epson's next-generation inkjet printing technology that merges advanced key component technologies and high-precision MEMS\* fabrication processes. The higher speed and image quality this enables will change expectations about business printers. Nozzle line length: 1.33 inch (33.8mm) Nozzles per line: 400 (400 x 2 rows) PrecisionCore MicroTFP print chip\* MEMS (Micro Electro Mechanical Systems): Devices possessing mechanically driven elements, made through application of semiconductor processing technology.

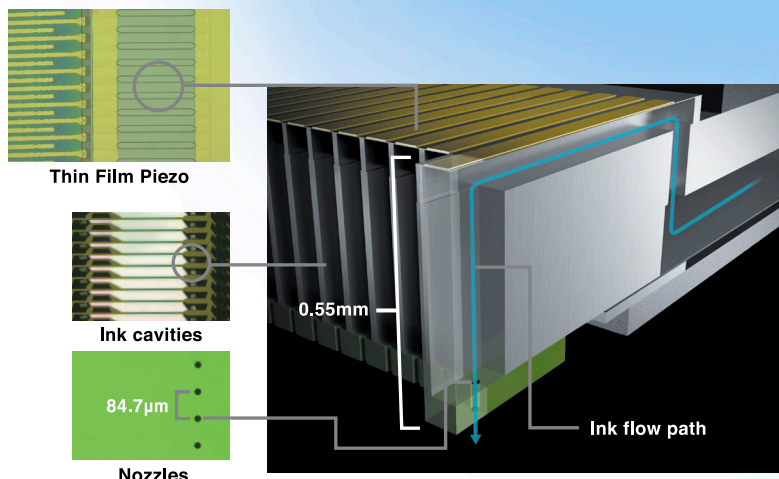
## PrecisionCore MicroTFP Print Chip

PrecisionCore MicroTFP print chips are the core element of PrecisionCore. Through achieving higher precision and greater miniaturization in Epson's unique thin film piezo (TFP) technology, which has been conventionally used only in large format commercial printers, the basic performance of this printhead module has been radically improved, and application to a wider range of uses made possible. Print chips are optimally arranged so that business inkjet printer heads can realize high-speed printing and excellent print quality.



## Thin Film Piezo – The Driving Force behind Ink Ejection

The thin film piezo that drives (actuates) ink ejection is approximately 1 micron thin (one-hundredth the thickness of a human hair). Through closely controlling the voltage applied to such piezo elements, it is possible to fire up to 50,000 shots of ink per second from a single nozzle, to precise positions and in the necessary quantities.

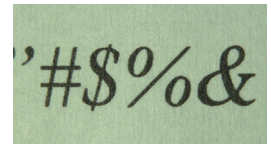
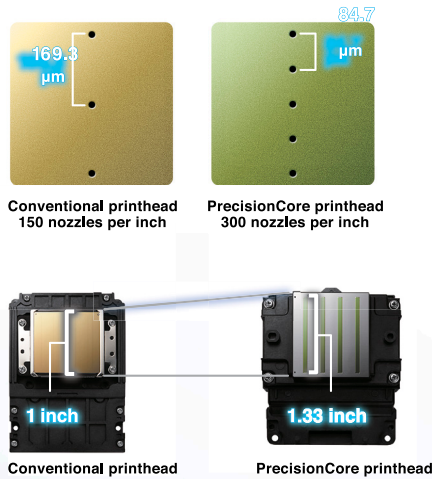


PrecisionCore MicroTFP print chip

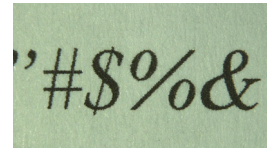


## Speed and Image Quality

In PrecisionCore printheads, the number of nozzles per row has been increased through widening the head from the conventional 1 inch to 1.33 inches and doubling the nozzle density. In addition to expanding the printable area in a single printing operation (pass) and accelerating the print speed, this allows high image quality of 600dpi to be achieved in a single pass in both black & white and color printing. As a result, smooth letter and line edges can be expressed even at printing speeds of 20ipm or faster, on a par with laser printing, thereby delivering both the speed and image quality that are required in office printers.



Laser printer print sample  
(12 point)

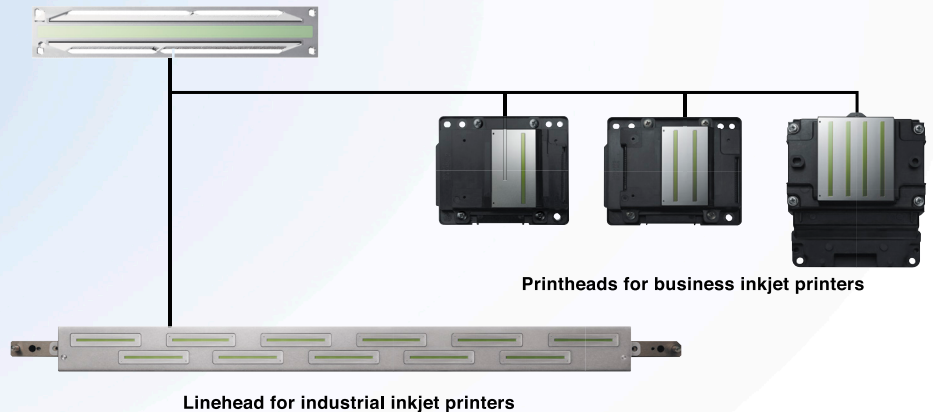


PrecisionCore inkjet print sample  
(12 point)

## Expanding Potential

Thanks to the scalable, modular design of PrecisionCore technology, the same print chips can be used to flexibly configure a variety of printheads, from lineheads for industrial presses to printheads for office desktop printers. Epson aims to further evolve PrecisionCore technology as a platform for inkjet technology and deploy it widely to new markets.

PrecisionCore MicroTFP print chip



The potential of PrecisionCore technology will continue to be developed in the future.

# Cost Efficiency • Versatility • High performance

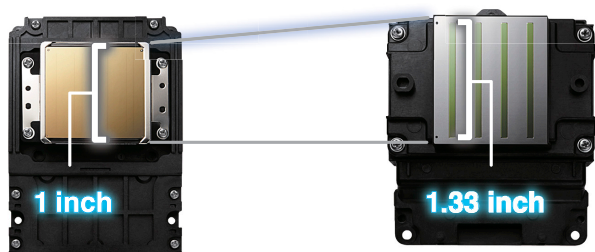
*“The simple construction of inkjet printers gives them a clear advantage over laser printers in a variety of areas. However, inkjet printers, with their strong image of being for home use, continue to be perceived as having insufficient basic capabilities for business printing, such as speed, image quality and durability. Epson’s newly developed inkjet printers have undergone a complete redesign, rooted in ideals completely different from those for home use devices, and by incorporating the same unique printhead technology used in Epson’s commercial and industrial printers, they have become cuttingedge inkjet printers completely optimized for business use. We have realized excellent standard performance, matching that of laser printers and capable of meeting all of the printing needs of an office with regards to including speed, high-volume printing on standard paper, and reliable operation.”*

## High Speed Printing for Business Efficiency

Offices that print business documents in large quantities require speed and accuracy in printing. Equipped with advanced PrecisionCore printheads and improved paper feed mechanisms, Epson’s business inkjet printers are fast and precise, and realize printing speeds of 20ipm or faster, on a par with laser printing.

### Newly Developed PrecisionCore Printheads

The head has been widened from the conventional 1 inch to 1.33 inches and the number of nozzles per row increased to 400 for higher density. High-speed, high-definition printing is made possible through expanding the printable area in a single pass in both monochrome and color printing.

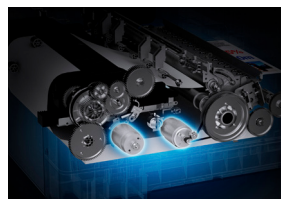


Conventional printhead

PrecisionCore printhead

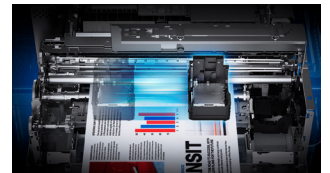
### Fast Paper Feed with Two Motors

Whereas a single motor was used to drive multiple paper feed rollers before, separate motors have been installed for paper feeding and document output. Without having to switch between motors, the first motor moves the sheet being printed while the second motor feeds additional sheets with almost no interval, thereby minimizing the gap between printed sheets and enabling high-speed printing.



### Faster Carriage Operation

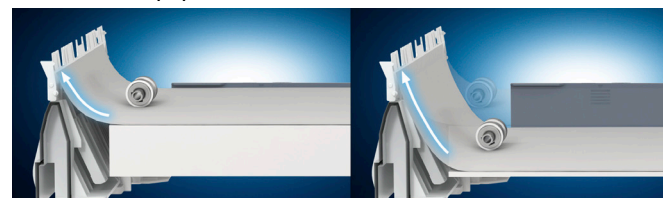
Through adopting a high performance motor to drive the carriage that moves the printhead above the paper, the carriage operation performance has been improved. Printing speed has thus been increased from 300 to 360 characters per second.



### Hopper Type Paper Cassette

The powered hopper automatically rises according to the remaining number of sheets. Through maintaining a constant pull-in position to the transport path, the optimum paper conveyance speed can be maintained.

Conventional paper cassette



Paper feed delay increases as paper level drops.

Hopper type paper cassette



Pick-up position is stable regardless of the paper level.

# Enhancing Business with High Image Quality

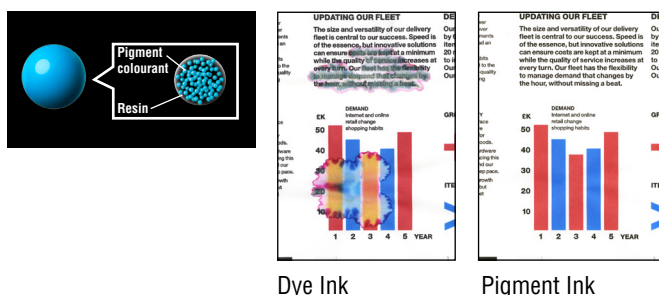
In developing business inkjet printers, Epson further evolved its printhead technology and ink technology to optimize it for business use. Epson's business inkjets can deliver high-quality plain paper printing with enhanced beauty, clarity, and accuracy on a par with laser printers.

## All Color Pigment Ink for Strong Water Resistance Printhead

The dye-based ink commonly used in inkjet printers is water-based, so plain paper output is not water-resistant and easily bleeds when splashed. Epson's business inkjet printers use water-insoluble pigment-based ink for all colors. This pigment ink is infused with a resin that binds the pigment together and fixes colorants to the paper surface. The characteristics of this pigment ink improve the quality of the printed output in several ways.

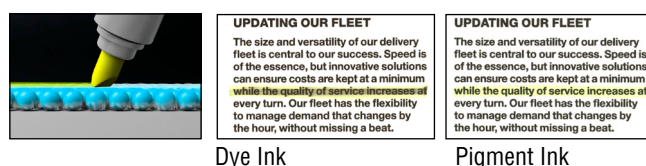
### No Smudging when Splashed

Because the pigment is non-soluble, it is water-resistant and doesn't smudge or bleed when splashed.



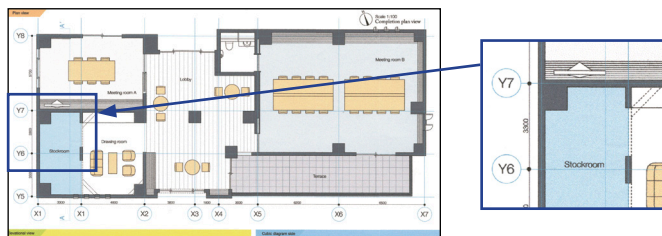
### Highlighter Resistance

As the pigment is fixed with a resin, it doesn't smudge even when a marker is applied.



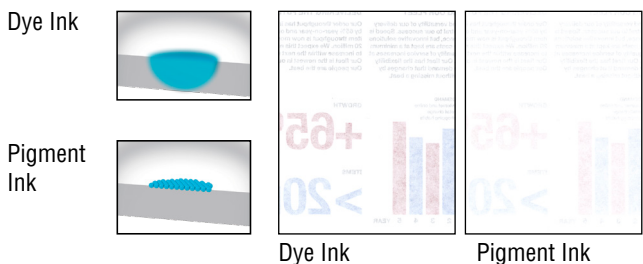
## Printhead Evolution for Higher Image Quality

By doubling the nozzle density, the new PrecisionCore printhead realizes 600dpi high quality printing on plain paper. Even intricate characters and the fine lines of design drawings are beautifully reproduced.



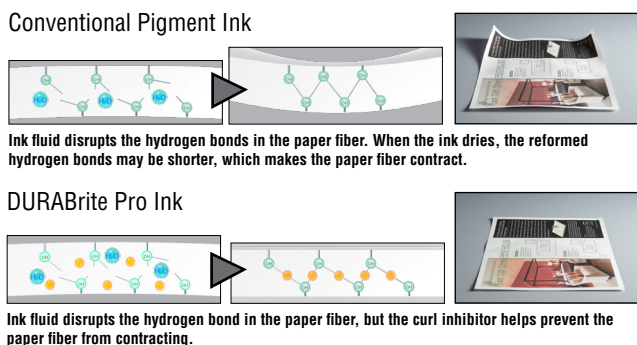
### Less Bleed-through

The pigment sits on the surface of paper without fully penetrating, so the image is hardly perceptible from the reverse side of the paper.



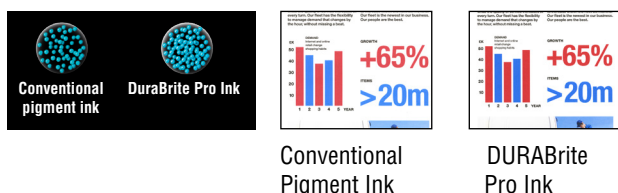
### Less Paper Curl

A drawback of inkjet-printed paper is that curling may occur over time. This is caused by contraction of hydrogen bonds in paper fibers when the water content of ink in the fibers evaporates. To prevent this, a curl inhibitor has been added to the new DURABrite Pro ink. This mitigates curling by preventing excessive contraction of fibers when the water content evaporates.



## Enhanced Pigment Concentration and Brighter Coloring

Epson has developed DURABrite Pro ink as the optimum ink for its high-speed business inkjet printers. Compared to conventional DURABrite Ultra ink, the pigment concentration has been increased to give brighter coloring. This allows graphs and images to be clearly expressed even on ordinary plain paper. Red and blue colors are especially vivid, satisfying the high image quality printing needs of offices.

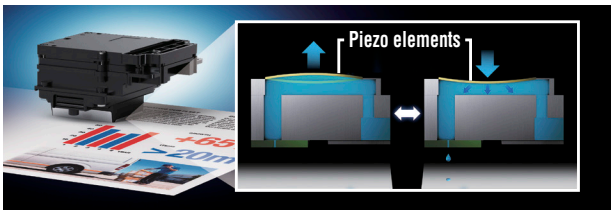


# Durability & Reliability to Keep Businesses Running

Epson has achieved greater robustness and longer service life by making countless improvements to every aspect of the devices, from the printhead, which is the heart of business inkjet, to the frame and components. Also, precision of the printing mechanism has been enhanced, thereby improving durability and reliability.

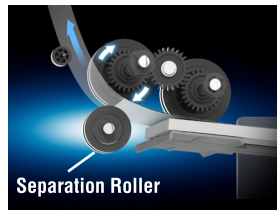
## Semi-permanent Printheads

PrecisionCore printheads utilize pressure to fire ink by means of piezo elements, which change shape when voltage is applied. Since this method uses no heat and entails no contact with media, there is no degradation caused by friction and heat. Moreover, because the piezo elements that are subject to pressure are ceramic, they are highly durable and can be used semi-permanently.



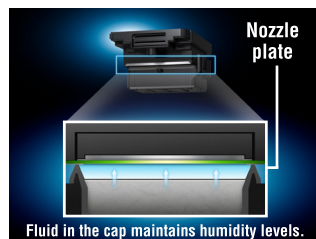
## Improved Paper Feed Precision Paper Separation Mechanism

For conveyance from the cassette to the paper path a hopper type cassette and separation roller system are combined to improve the paper pull-in accuracy and reduce double feeds.



## Minimizing Nozzle Clogging Preventing Ink Drying

Ink drying inside the head is reduced by changing the materials inside the head and ink system, and adopting a head cap anti-evaporation mechanism. This guards against head clogging when the printer isn't used for a long time.



## Highly Durable Parts and Structure

A strong metal frame is adopted inside the housing to create a sturdy structure that maximizes the performance of the printhead, carriage and paper feed components. The paper feed roller, which is integral to this paper feed mechanism, is made from highly durable material. Moreover, the roller diameter has been increased to reduce the number of revolutions, making it possible to realize longer service life.



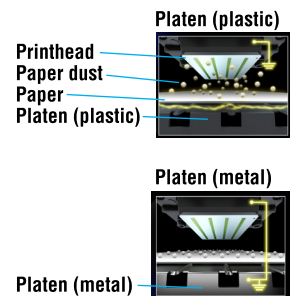
## Improved Paper Feed Precision Double Paper Output Rollers

By adopting double paper output rollers, the paper is stabilized and there is less risk of paper jamming.



## Minimizing Nozzle Clogging Reducing Paper Dust

In order to prevent nozzle clogging caused by paper dust particles, metal material is used for the platen situated underneath the paper during printing. This eliminates static electricity and prevents paper dust from adhering to the nozzles.



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**Epson WorkForce Pro WF-R5190**  
Page Size: A4  
Single Page Speed: 20ppm  
Duplex Print Speed: 11ppm  
Ink Yield: 50,000\*  
Paper Capacity: 580 sheets



**Epson WorkForce Pro WF-R5690**  
Page Size: A4  
Single Page Speed: 20ppm  
Duplex Print Speed: 11ppm  
Ink Yield: 50,000\*  
Paper Capacity: 580 sheets



**Epson WorkForce Pro WF-R8590**  
Page Size: A3+  
Single Page Speed: 24ppm  
Duplex Print Speed: 16ppm  
Ink Yield: 75,000\*  
Paper Capacity: 831 sheets



**Epson WorkForce Pro WF-R8590TC**  
Page Size: A3+  
Single Page Speed: 24ppm  
Duplex Print Speed: 16ppm  
Ink Yield: 75,000\*  
Paper Capacity: 1,831 sheets