

MARCH 2018

Brother Genuine Toner Cartridges for the Brother HL-L6300DW versus Ten Third-Party Brands

Keypoint Intelligence – Buyers Lab was commissioned by Brother Industries Limited (Brother) to conduct an independent comparative lab evaluation of the performance of Brother genuine TN-3480 toner cartridges in reliability, image quality, and toner yield against that of ten third-party toner cartridges, with 11 Brother HL-L6300DW printers used as test devices. Ten third-party brands were selected as representative samples from the range of third-party toners available, and were anonymized using Brand B, Brand C, Brand D, Brand E, Brand F, Brand G, Brand H, Brand I, Brand J, and Brand K. All cartridges were purchased by Buyers Lab on the open market.

Each third-party toner brand was tested on a new Brother HL-L6300DW printer dedicated to a single brand to eliminate cross contamination. All cartridges were run until end of life, using a heavy-coverage mixed test suite (multi-page, text- and graphics-based documents, with page coverage ranging from 2% to 17%, and an average page coverage of 8.5% over the entire test suite). Note, for comparison purposes, the toner yield test target adopted by the printer industry has only 5% page coverage. All failures, including misfeeds/paper jams, printer damage, early end-of-life, and out-of-box failures, were recorded.

Executive Summary

While many consumers might think that third-party toners are an inexpensive and reliable alternative to genuine toner, they may be unaware of the hidden costs of these alternate brands. Genuine toner from the original printer manufacturer is engineered to work reliably with a specific printer, providing full yield and ideal image quality from first page to last. The same cannot be said for many third-party toners, which are designed more generically.

In Buyers Lab's test, the Brother genuine toner performed flawlessly throughout, whereas all other brands experienced at least one fault (excessive toner leakage, cartridge not recognized, poor image quality, dirty charge wire) that resulted in early toner replacement or unexpected maintenance. For the end-user, this translates to downtime and increased maintenance costs, so despite the low upfront cost of third-party cartridges, users can end up spending more over the life of the printer when using such cartridges.

In Buyers Lab's page yield tests, the Brother genuine toner produced both the highest total output and the highest average output. When comparing the average across all third-party brands' cartridges, the Brother toner produced 57% more output.

OVERALL PERFORMANCE AT A GLANCE

| OVERALL RATINGS FOR ALL CATEGORIES | Total Yield of Ten Cartridges (Heavy-coverage original) | Total Yield of First Drum | Overall Image Quality Score | Number of Maintenance issues |
|------------------------------------|---|---------------------------|-----------------------------|------------------------------|
| Brother | 50,612 | 50,123 | 18.4 | 0.0 |
| Brand F | 50,597 | 40,502 | 17.0 | 1.0 |
| Brand D | 40,376 | 29,316 | 15.0 | 5.0 |
| Brand I | 36,540 | 29,346 | 17.5 | 12.0 |
| Brand J | 36,139 | 32,288 | 14.5 | 10.0 |
| Brand H | 35,311 | 29,139 | 16.5 | 9.0 |
| Brand C | 32,572 | INA | 13.6 | 17.0 |
| Brand B | 31,286 | 23,122 | 16.0 | 12.0 |
| Brand E | 30,831 | 22,819 | 15.2 | 12.0 |
| Brand K | 19,081 | INA | 16.2 | 12.0 |
| Brand G | 8,441 | INA | 18.0 | 8.0 |
| Average for Third-Party Brands | 32,117 | 29,505 | 16.0 | 9.8 |

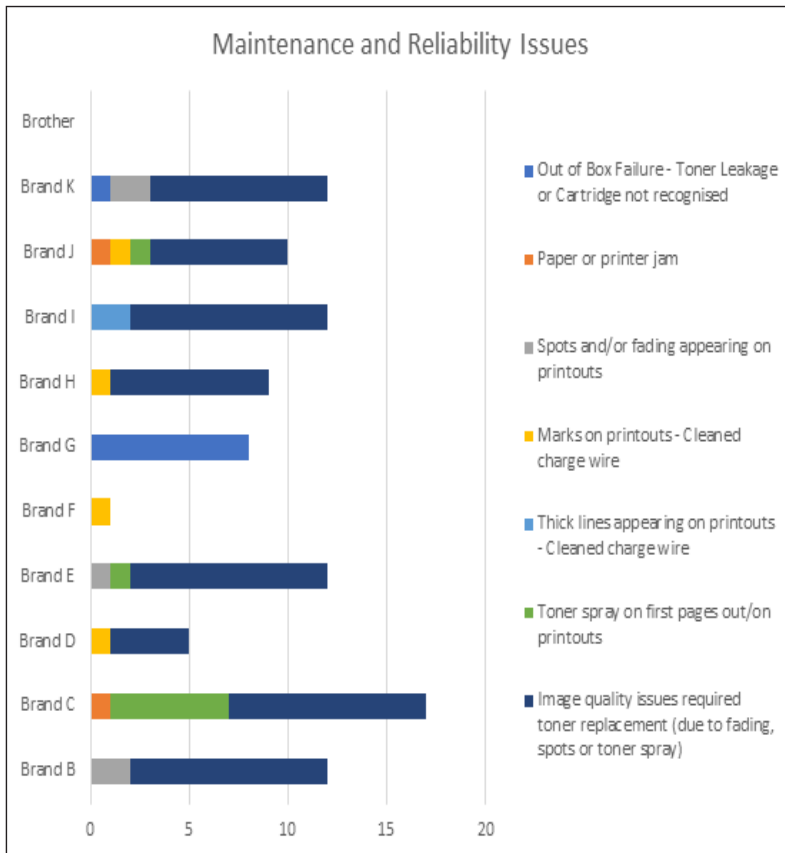
The table above shows overall ratings for all categories (sorted by cartridge yield).

In Buyers Lab's testing, the Brother genuine toner brand delivered the best performance in all key categories, including cartridge yield, drum yield, image quality, and reliability. While it may seem that one or other of the brands has given an acceptable performance in one category, it is only by looking at all categories combined that a more balanced view can be obtained. For example, although Brand F's cartridge yield may appear competitive, not only did the Brand F toner deliver 19% less yield from its drum, which means greater cost, more frequent maintenance, and more downtime, it also produced inferior image quality with visible toner overspray, and text that was light and patchy at times. Moreover, its printed output showed signs of drum damage (see the section of the report devoted to image quality defects) and in the toner adhesion test, a significant amount of toner was lifted from the page. Similarly, while Brand G came second in image quality for the cartridges tested, it suffered eight out-of-box cartridge failures with significant amounts of toner leakage, rendering the cartridges unusable (see the section of the report dedicated to out-of-box failures). In conclusion, based on combined performance across all categories in Buyers Lab's test, Brother genuine toner is the best choice overall, delivering superior reliability, yield, and quality compared to all third-party brands tested.

Reliability

All the Brother cartridges completed testing with no image quality failures, jams, leakage, or printer damage. In contrast, all the other brands tested experienced at least one failure. The least reliable toner, Brand G, suffered eight out-of-box failures due to excessive toner leakage and was only able to complete two cartridges' worth of output. Another third-party brand (Brand K) experienced an out-of-box failure because the cartridge could not be recognized by the printer. Across all third-party brands, as many as 68 toner cartridges had to be replaced before they were fully used because of poor image quality (spots, toner spray, fading etc.). Four brands each had ten cartridges that failed in this manner (Brand I, Brand C, Brand B, and Brand E). Other cartridges produced output that exhibited marks or thick lines that necessitated cleaning of the charge wire.

Total Unplanned Maintenance and Reliability Issues

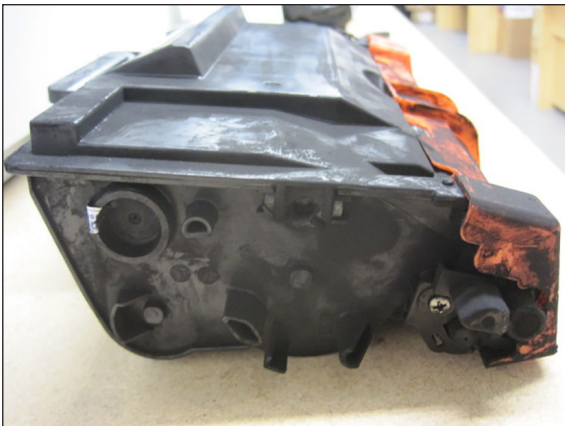


Buyers Lab technicians recorded a total of 98 maintenance or reliability issues for all third-party brands combined, while the Brother cartridges operated flawlessly, making the Brother toner cartridges the most reliable out of all those tested. As a group, the third-party brands suffered an average of 9.8 issues of one kind or another, as shown in the graph above.

Out-of-Box Failures

An out-of-box failure is when a brand-new cartridge cannot be used for some reason. When this happens, the customer incurs not only the extra cost of buying a replacement cartridge, but also suffers the inconvenience of having to order supplies more frequently.

Brand G had eight cartridge failures due to excessive toner leakage, and work surfaces became soiled as the toner was removed from the packaging. In an office environment, the cleanup would cause a delay in getting the machine running again, along with the added inconvenience and cost associated with toner damage to office furnishings or workers' clothes.



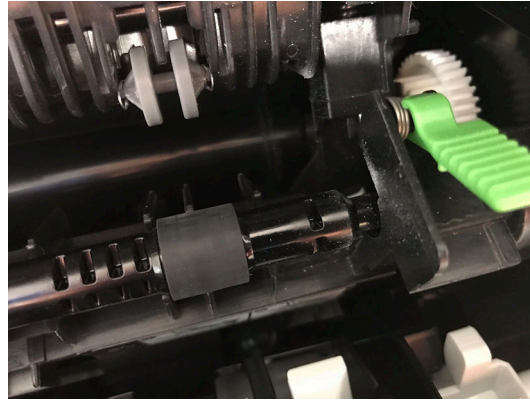
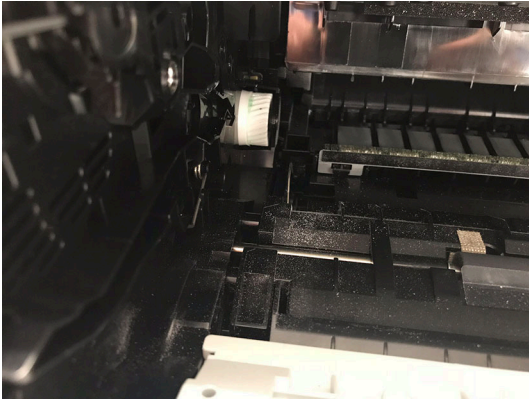
Eight cartridges from Brand G (examples shown above) experienced significant toner leakage right from the start. (Cartridges with this degree of toner leakage are considered out-of-box failures.)



The first Brand K toner cartridge could not be recognized by the device, generating an error code upon installation.

Toner Leakage During Use

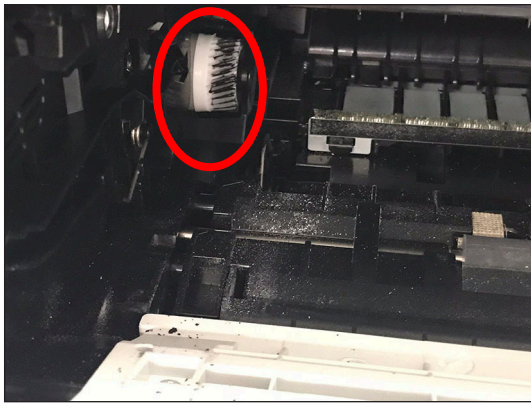
At the end of testing, Brother was the only toner cartridge brand to leave the printer in a clean condition. Without exception, all third-party brands tested left toner deposits inside the machine. Leaking toner increases cleaning effort, creates image quality defects, and the build-up of excess toner could also result in reliability issues such as jamming, grinding gears, and premature wear on components, which would mean additional costs for the user.



In the machine dedicated to Brother genuine toner (above left), the gear is clean and there is no sign of toner dust on the paper transport or the fuser entrance, above right; similarly, there is no evidence of toner dust at the back of the machine.



A significant amount of toner dust accumulated in the machine that ran Brand C cartridges (above).



By the end of testing, a significant amount of toner dust had been deposited on the gear of the Brand H machine (above). Several other brands experienced similar build-up on the gears throughout testing.



The printer using Brand F cartridges showed significant toner leakage on the manual feed tray, which could contaminate users' hands and pages with toner.

Yield

Tested Page Yields



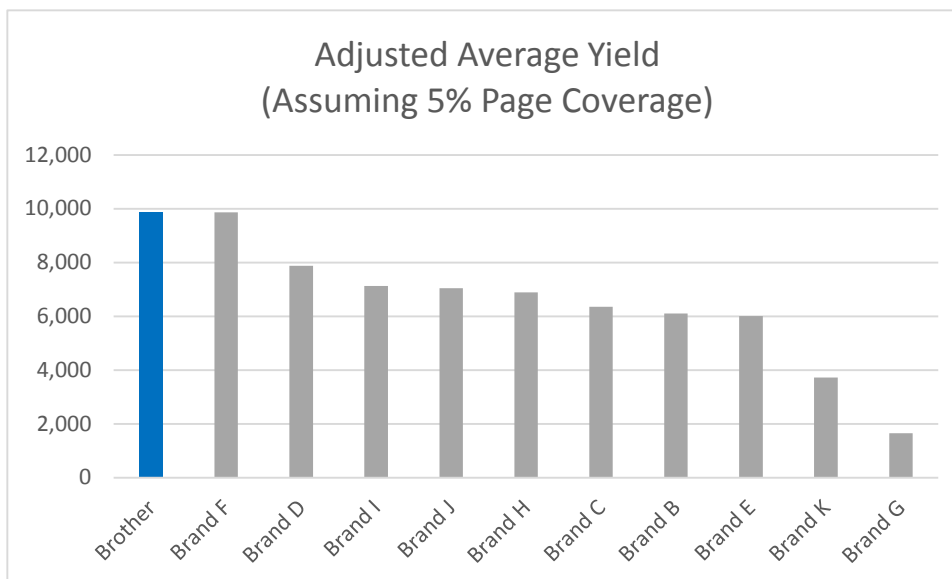
For this test, Buyers Lab used a mix of heavy-coverage documents (pictured above). Pages in this test suite range from 2% to 17% coverage, with an average page coverage of 8.5% over the entire test suite. The Brother genuine toner rated yield of 8,000 pages is based on an ISO test target, which has lighter coverage (~5%). As such, tested yields are lower than claimed yields. Yields from this test are for comparative purposes only. Note that while the original files are in color, the HL-L6300 prints in black only, so images were rendered in greyscale.

- In Buyers Lab's testing, the Brother genuine toner delivered the highest average yield, with all ten cartridges completing testing. When compared with the overall average tested yield across all third-party brands, the Brother genuine toner cartridges produced approximately 57% more impressions.

| Cartridge Manufacturer | Exhausted Cartridges | Total Yield |
|------------------------|----------------------|-------------|
| Brother | 10 | 50,612 |
| Brand F | 10 | 50,597 |
| Brand D | 10 | 40,376 |
| Brand I | 10 | 36,540 |
| Brand J | 10 | 36,139 |
| Brand H | 10 | 35,311 |
| Brand C | 10 | 32,572 |
| Brand B | 10 | 31,286 |
| Brand E | 10 | 30,831 |
| Brand K | 9 | 19,081 |
| Brand G * | 2 | 8,441 |

Tested pages based on Buyers Lab testing in simplex and duplex mode using a multi-page heavy coverage test suite.

*Buyers Lab technicians were unable to complete testing of Brand G because 8 out of 10 cartridges were out-of-box failures, due to excessive toner leakage.



Note: when calculating averages, any out-of-box failures were counted as 0 yield and included in the calculations.

| | Heavy Coverage | Typical Document (5% page coverage) ~ |
|---------------------------------------|----------------|---------------------------------------|
| Average Yield for Brother Toner | 5,061 | 9,869 |
| Average Across all Third-Party Brands | 3,212 | 6,263 |
| % More Produced by Brother Toner | 57 | |

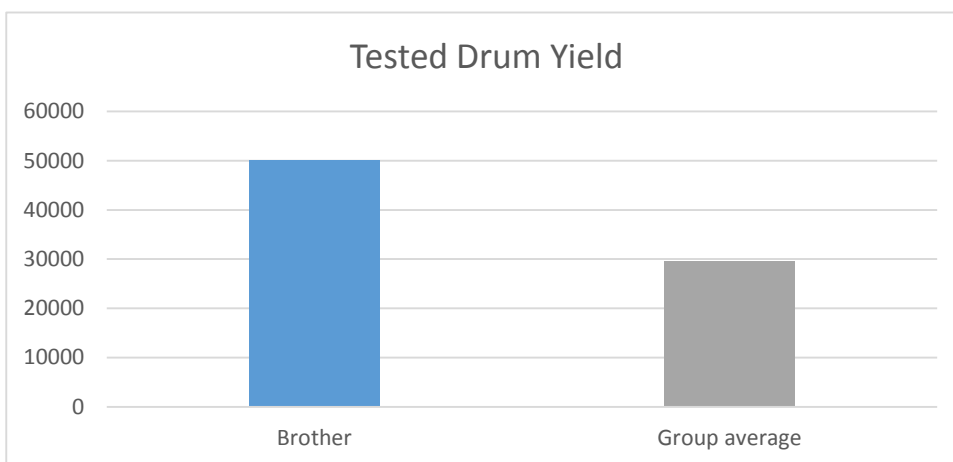
*Out of box failures were counted as 0 yield and included in the average calculations.

~Yields were adjusted based on a factor of 1.95 times the tested yield to account for the differences in page coverage.

Yield of the First Drum

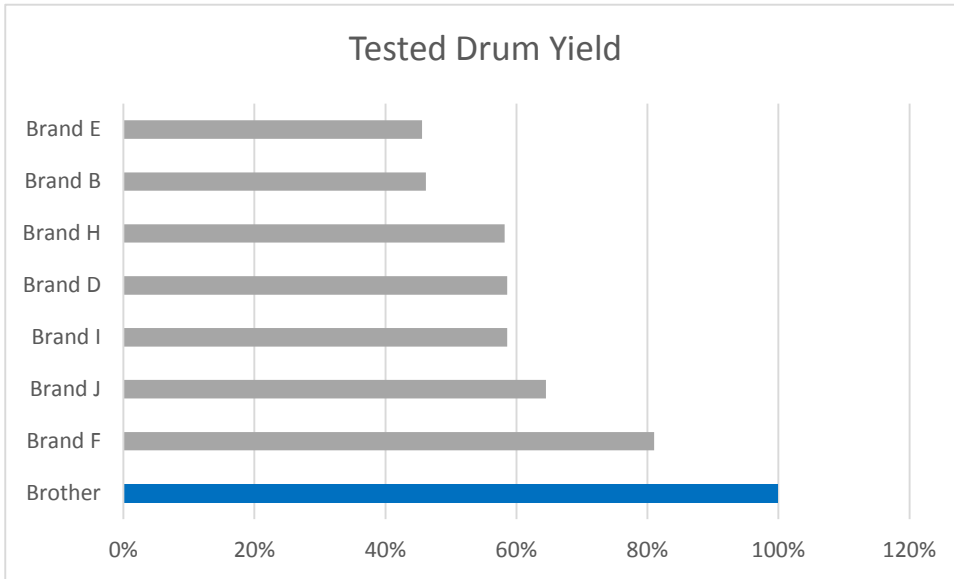
The printer running with the Brother toner cartridge performed flawlessly over its full life, delivering 50,123 impressions before requiring a drum change. However, seven of the printers using third-party toner required one or more drum changes before the drum rated yield had been reached. This was largely due to black lines or dark bands appearing to the left of the page or at the bottom of the page respectively. In fact, one printer, running with the Brand E cartridge, required a drum change after only 22,819 impressions (46% of rated drum yield). Also noteworthy is that the Brand F test required two drum changes, the first at 40,502 impressions, and then a second just 10,656 impressions later (at 51,158 impressions), and for the customer, more frequent drum changes translates to greater running costs and increased downtime.

The tests involving Brand C, Brand K and Brand G third-party cartridges did not involve any drum changes, nor did they achieve the drum's rated yield; they delivered 32,572 impressions, 19,081 impressions and 8,441 impressions, respectively.



| | Impressions Before First Drum Change | Performance Compared to Rated Yield |
|-----------------|--------------------------------------|-------------------------------------|
| Brother | 50,123 | 100% |
| Group average * | 29,505 | 59% |

* The average of seven third-party brands that required a drum change.



When compared to the seven brands that required a drum change, the Brother cartridge printed between 19% and 54% more impressions before requiring a drum change.

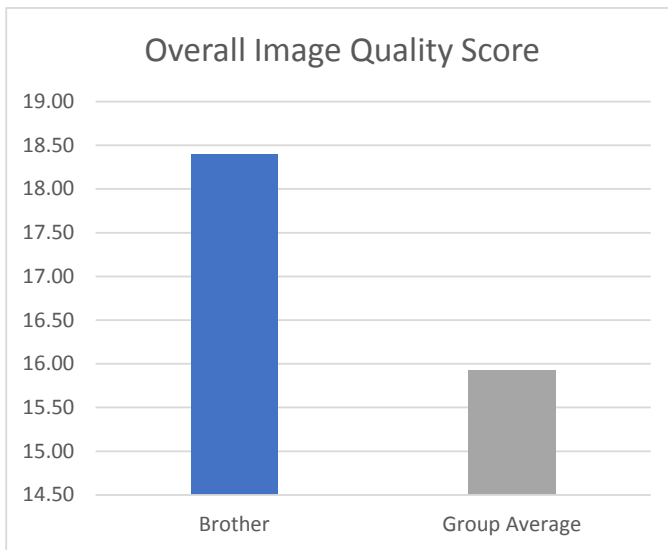
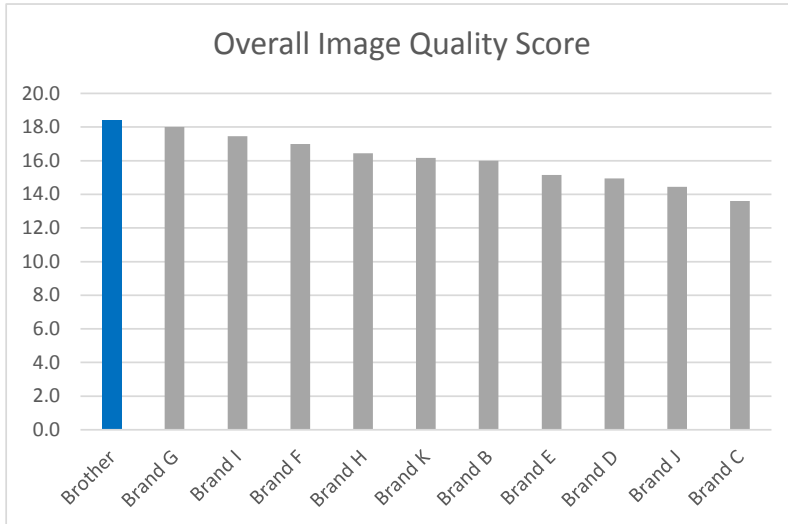
Image Quality

Image quality is assessed in a number of areas, such as halftones, text and fine lines, and solid density and consistency. Buyers Lab's proprietary image quality test targets were printed on each device, and samples from the beginning and end of each cartridge were subjected to a battery of tests to rate image quality. The results were then compared and graded on a five-point scale where 5 is excellent, 4 is very good, 3 is good, 2 is fair and 1 is poor. From a user perspective, output with an excellent rating would be nearly flawless and able to be distributed internally or externally to clients, good output would be average, showing some slight defects or flaws, while poor would have major defects and would generally be unusable.

The Brother genuine toner cartridges performed the best of all brands in three of the five image quality categories tested and consistently delivered high-quality output: text was very good, with consistent boldness, fully formed characters and crisp, well-defined edges; above-average line art featured smooth lines with consistent dotfill; halftone pattern was good overall, with no banding; halftone range showed separation of all ten levels from 10% through to 100%; solids were very good overall, with no mottling. Although the measured density of the printed output delivered by the Brother genuine toner cartridges was less dark than all the competitor brands, it was the strongest performer overall. In comparison, all third-party brands' image quality scored lower than Brother in the Text, Halftone Pattern, and Solids categories. While some third-party brands' halftone range produced greater separation, there was also evidence of banding, fading, flaking, spots and background overspray. Some text and line art were not clearly formed due to significant patchiness. All these defects are reflected in the scoring and explain why the third-party brands received lower ratings. However, the inferior standard of the third-party brands' image quality is evidenced most emphatically by the early replacement of toner cartridges, as documented in the reliability section of the report.

AVERAGE IMAGE QUALITY SCORES

Each of the five image quality categories is rated on a five-point scale where 5 is excellent, 4 is very good, 3 is good, 2 is fair and 1 is poor. The scores for each category are added together to give the overall score. A perfect score would be 25 points.



For the average image quality scores, each criterion is rated individually as an average across all cartridges, the overall score is the average across all criteria.

| | Brother | Brand B | Brand C | Brand D | Brand E | Brand F | Brand G | Brand H | Brand I | Brand J | Brand K | Group Average |
|-------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------------|
| TEXT | 4.00 | 3.00 | 2.50 | 2.85 | 2.80 | 3.45 | 2.75 | 3.25 | 3.25 | 3.00 | 2.94 | 2.98 |
| LINE ART | 3.70 | 2.95 | 2.75 | 3.00 | 2.80 | 3.30 | 3.75 | 3.05 | 3.35 | 3.00 | 2.83 | 3.08 |
| HALFTONE PATTERN | 3.50 | 3.20 | 2.25 | 2.80 | 2.50 | 3.00 | 3.00 | 2.85 | 2.45 | 2.00 | 2.44 | 2.65 |
| HALFTONE RANGE | 3.70 | 3.60 | 3.45 | 3.40 | 4.25 | 4.60 | 5.00 | 3.85 | 4.95 | 3.85 | 4.56 | 4.15 |
| SOLIDS | 3.50 | 3.25 | 2.65 | 2.90 | 2.80 | 2.65 | 3.50 | 3.45 | 3.45 | 2.60 | 3.39 | 3.06 |
| Overall | 3.68 | 3.20 | 2.72 | 2.99 | 3.03 | 3.40 | 3.60 | 3.29 | 3.49 | 2.89 | 3.23 | 3.18 |

5 = excellent; 4 = very good; 3 = good; 2 = fair; 1 = poor

TEXT QUALITY SAMPLES (MAGNIFIED TO SHOW DETAIL)

• When viewed under magnification, the text samples from the Brother genuine toner were all crisp and sharp, with fully formed characters and no visible overspray. Text from the third-party brands showed some inconsistent fill and broken edges, with evidence of background, flaking and random spots of toner.

• Overall, output produced by the Brother genuine toner was cleaner and more consistent than that produced by the third-party cartridges.

| Brother Genuine | Brother Genuine | Brother Genuine | Brother Genuine |
|--|--|--|--|
| I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get |
| We've also got to to race their R2 through out the | We've also got to to race their R2 through out the | We've also got to to race their R2 through out the | We've also got to to race their R2 through out the |
| End of Cartridge 1 | End of Cartridge 3 | End of Cartridge 7 | End of Cartridge 10 |

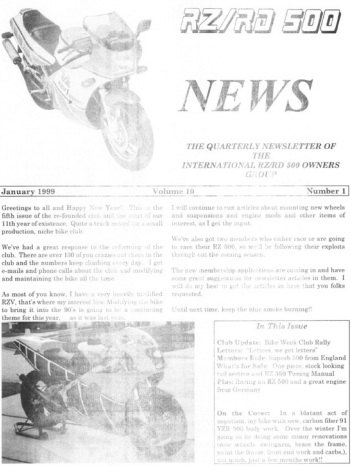
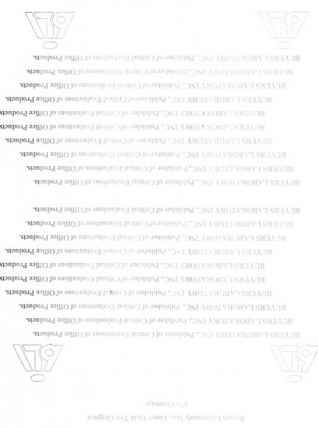
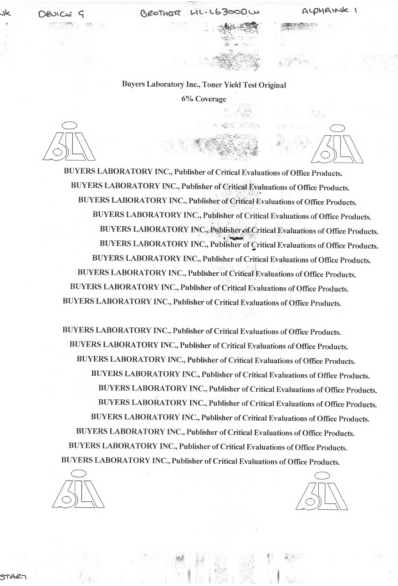
| Brand H | Brand H | Brand H | Brand H |
|--|--|--|--|
| I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get |
| We've also got to to race their R2 through out the | We've also got to to race their R2 through out the | We've also got to to race their R2 through out the | We've also got to to race their R2 through out the |
| End of Cartridge 1 | End of Cartridge 3 | End of Cartridge 7 | End of Cartridge 10 |

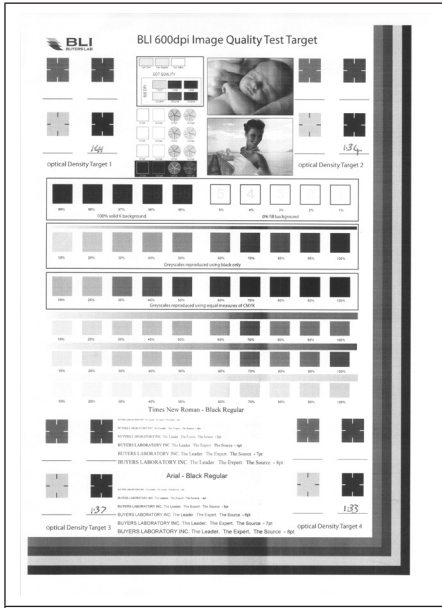
| Brand D | Brand D | Brand D | Brand D |
|--|--|--|--|
| I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get | I will continue to and suspension interest, as I get |
| We've also got to to race their R2 through out the | We've also got to to race their R2 through out the | We've also got to to race their R2 through out the | We've also got to to race their R2 through out the |
| End of Cartridge 1 | End of Cartridge 3 | End of Cartridge 7 | End of Cartridge 10 |

| Brand B | Brand B | Brand B | Brand B |
|--|--|--|--|
| I will continue t and suspension interest, as I get We've also got t to race their R2 through out the | I will continue t and suspension interest, as I get We've also got t to race their R2 through out the | I will continue t and suspension interest, as I get We've also got t to race their R2 through out the | I will continue t and suspension interest, as I get We've also got t to race their R2 through out the |
| End of Cartridge 1 | End of Cartridge 3 | End of Cartridge 7 | End of Cartridge 10 |

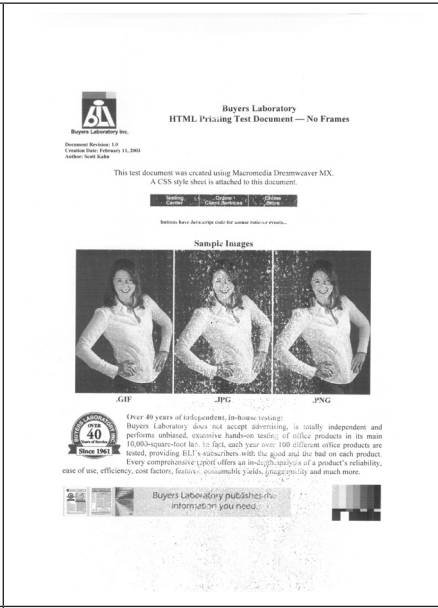
• As testing progressed, output from the Brother genuine toner remained consistent, while output from the other brands began to deteriorate or showed defects such as toner flaking, overspray, banding, streaks or fading.

EXAMPLES OF IMAGE QUALITY DEFECTS (SOME SAMPLES MAGNIFIED TO SHOW DETAIL)

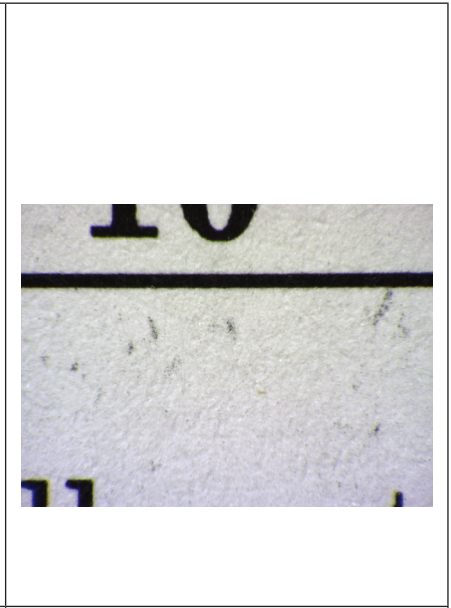
| | | |
|---|--|--|
|  |  |  |
| <p>Brand E's fifth cartridge ran out of toner without notification, resulting in very faded output.</p> | <p>Brand I's first cartridge ran out of toner without notification, consequently output was extremely faded.</p> | <p>The first page out of Brand G's third cartridge exhibited significant ghosting.</p> |



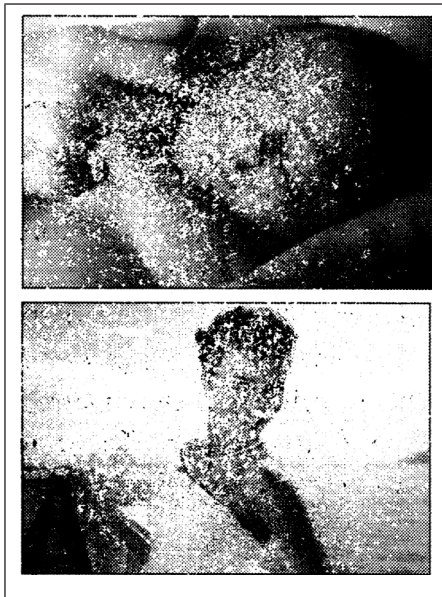
During processing of Brand I's fourth cartridge a dark band appeared in the output, clearly seen at the bottom of the page.



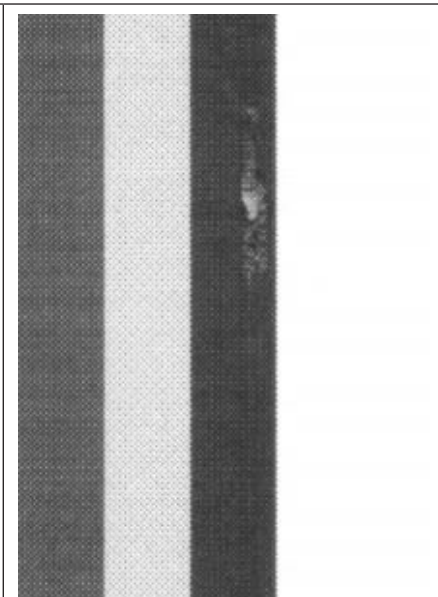
Significant flaking was evident on output from Brand K's fourth cartridge.



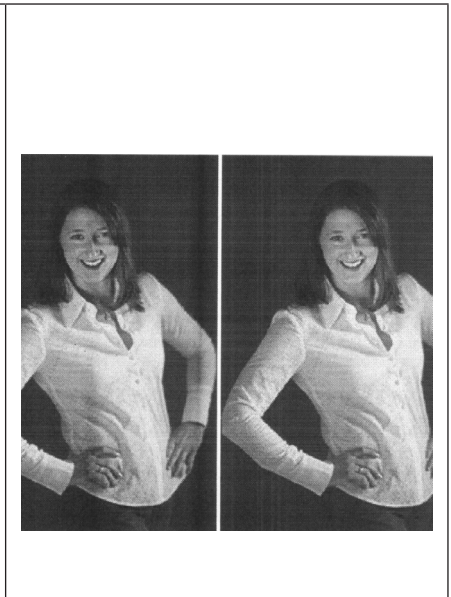
Brand F's fifth cartridge exhibited background overspray, seen here under magnification.



This magnified image shows severe flaking and spots present on Brand B's ninth cartridge.



Although there were no visible signs of drum damage, the latter has caused the white marks that appeared at regular intervals along the right edge of output produced by Brand F's eighth cartridge.



The magnified image above demonstrates the significant amount of streaking that appeared on Brand I's sixth cartridge.


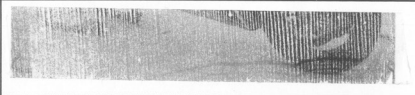


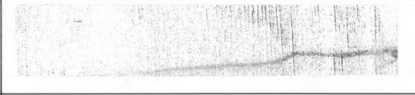


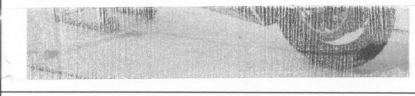
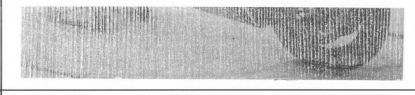
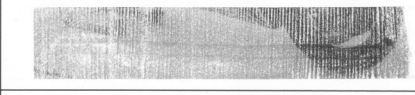

IMAGE PERMANENCE

Toner Adhesion

Good toner adhesion is necessary to ensure the longevity and survival of printed documents, so that toner does not rub off over time. Not only does smudged toner reduce the attractiveness of copy, it can also make text unintelligible and make photos, charts, and graphs unclear, which means the potential loss of business intelligence.

To test the effectiveness of each brand's toner adhesion, Buyers Lab subjected the output of each toner brand to a tape test. A lab technician pressed clear tape against a target on one of the proprietary Buyers Lab image quality test documents and then pressed the tape onto a blank sheet, so that the amount of toner that had been pulled off could be seen.

The photograph below shows the extent of toner lifting when clear tape was applied to printed output and removed.

| | | | |
|---------|---|---------|--|
| Brother |  | Brand G |  |
| Brand B |  | Brand H |  |
| Brand C |  | Brand I |  |
| Brand D |  | Brand J |  |
| Brand E |  | Brand K |  |
| Brand F |  | | |

Cartridge number: 7

As can be seen from the photograph above, the tape has taken hardly any toner off the Brother genuine toner's output, indicating superior toner adhesion and image permanence. In contrast, all other toner brands tested showed significant toner lifting off the page when the tape was applied and removed. The results for cartridge seven, shown above, are representative of the results for all the other cartridges.

SUTHERLAND RUB TEST

Buyers Lab also subjected the output of each toner brand to an abrasion test, where output is subjected to rub testing using the Sutherland Rub Tester. No notable amount of toner transfer was evident at any point during the Sutherland Rub testing, though Buyers Lab’s instruments were able to detect minor differences in density from the beginning to the end of testing, with third-party brands showing comparable to slightly better toner fusing than Brother genuine toner when subjected to friction.

| | Difference in Density |
|----------------------------|-----------------------|
| Brother | 0.003 |
| Third-Party Average | 0.002 |

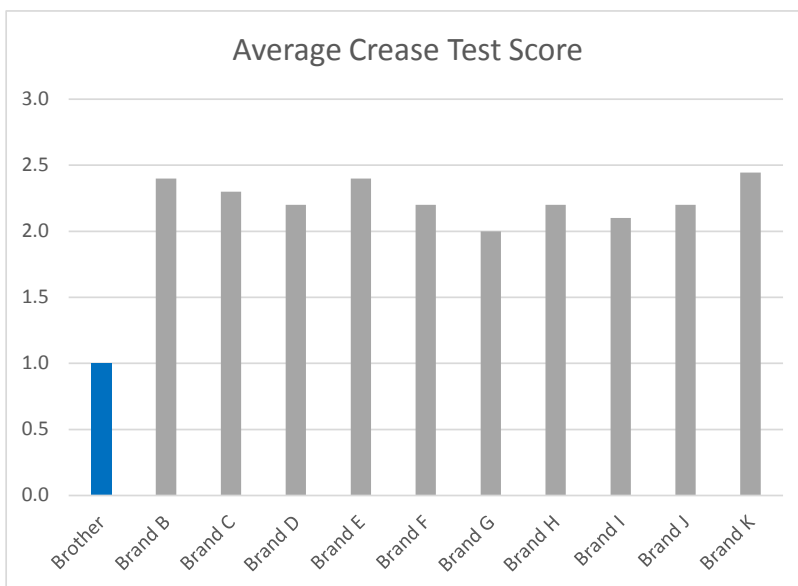
The readings above show the average difference in density following the Sutherland Rub abrasion test

The Sutherland Ink Rub Tester and 4-lb (1.82-kg) test block covered with Buehler Ltd. micro-cloth is used to perform the abrasion and smudge test on images generated on a printer. The recommended test pattern uses a series of six lines with thirty capital “I” s per row. Spacing between characters should be sufficient to allow the positioning of the aperture of the reflectometer (or densitometer) without touching the characters.

HARD CREASE TEST

Buyers Lab also subjected the output of each toner brand to a hard crease test, where output was folded so the printed side was on the inside, and then a 2 kg weight was rolled across the page to crease it. The page was unfolded, and output was examined for toner cracking or flaking at the fold. Grades assigned were Minimal(best), Non-excessive, and Excessive (worst).

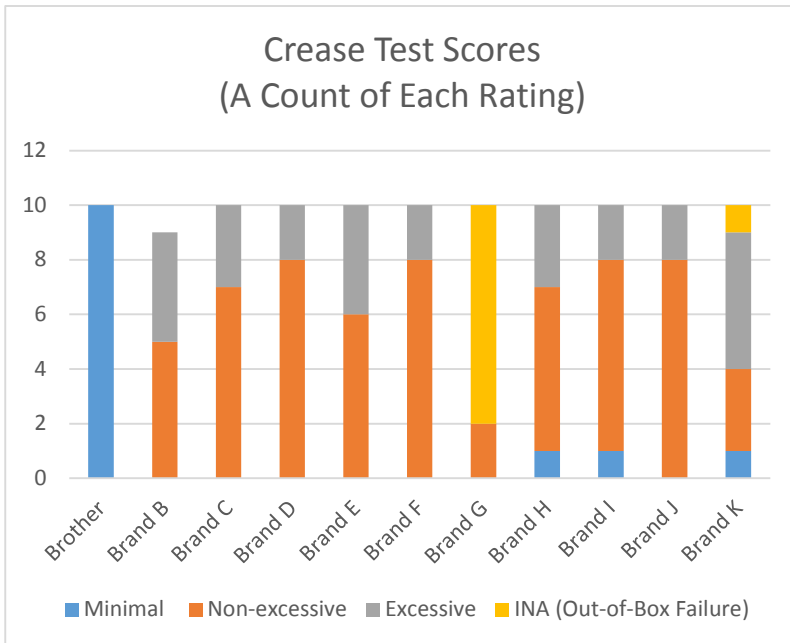
- Brother was the only brand to exhibit only minimal flaking or cracking across all ten cartridges tested, as demonstrated by its average score of one, seen in the chart below.
- The third parties’ group average score was 2.2, indicating that on average the samples suffered cracking or flaking that was worse than non-excessive.



In the chart above the scores are: 1 = minimal; 2 = non-excessive; 3 = excessive.

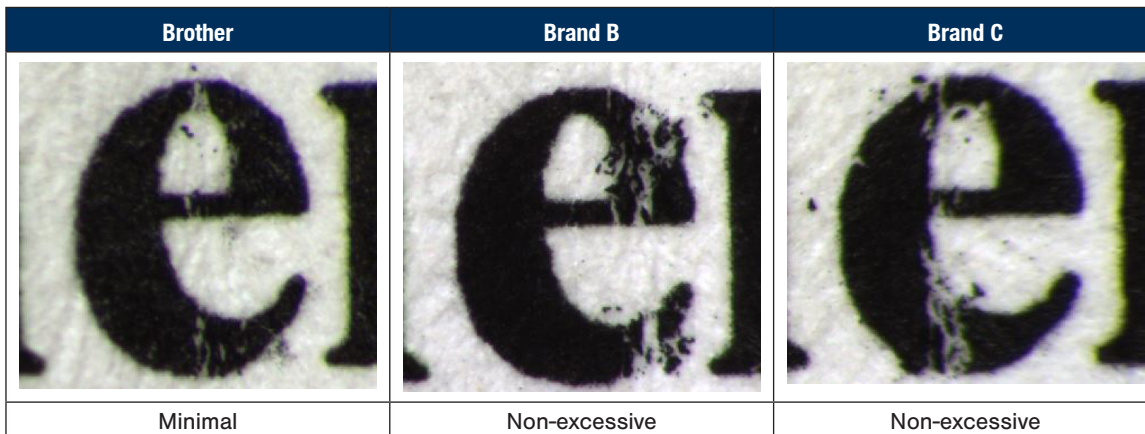
In the crease test, the Brother genuine toner delivered a consistently good performance with only minimal toner flaking or cracking, whereas the third-party brands suffered significantly more flaking and cracking.




- More than 96% of the third parties' output yielded a rating of non-excessive or excessive.









The chart above shows a count of each rating, mostly blue is best (minimal flaking or cracking), followed by orange (second best), and then grey (worst).




Below are images of the hard crease test results. Samples were taken from cartridge 7 of every brand tested, and images are magnified to show detail.



| Brother | Brand D | Brand E |
|---|---|--|
|  |  |  |
| Minimal | Minimal | Non-excessive |

| Brother | Brand F | Brand G |
|--|--|---|
|  |  |  |
| Minimal | Non-excessive | Non-excessive |

| Brother | Brand H | Brand I |
|---|---|--|
|  |  |  |
| Minimal | Excessive | Non-excessive |

| Brother | Brand J | Brand K |
|---|---|--|
|  |  |  |
| Minimal | Non-excessive | Excessive |

Supporting Test Data

Event Summary Counts

| | Out of Box Failure - Toner Leakage or Cartridge not recognized | Paper or printer jam | Spots and/or fading appearing on printouts | Marks on printouts - Cleaned charge wire | Thick lines appearing on printouts - Cleaned charge wire | Toner spray on first pages out/on printouts | Image quality issues required toner replacement (fading, spots, or toner spray) | Total Unplanned Items |
|--|---|----------------------|--|---|---|---|---|-----------------------|
| Brother | | | | | | | | 0 |
| Device B | | | 2 | | | | 10 | 12 |
| Device C | | 1 | | | | 6 | 10 | 17 |
| Device D | | | | 1 | | | 4 | 5 |
| Device E | | | 1 | | | 1 | 10 | 12 |
| Device F | | | | 1 | | | 0 | 1 |
| Device G | 8 | | | | | | 0 | 8 |
| Device H | | | | 1 | | | 8 | 9 |
| Device I | | | | | 2 | | 10 | 12 |
| Device J | | 1 | | 1 | | 1 | 7 | 10 |
| Device K | 1 | | 2 | | | | 9 | 12 |
| Total across all third-party brands | 9 | 2 | 5 | 4 | 2 | 8 | 68 | 98 |

Test Methodology

KeyPoint Intelligence – Buyers Lab was commissioned by Brother International Limited (BIL) to conduct an independent comparative lab evaluation of the performance of genuine Brother toner cartridges in reliability, image quality and toner yield against “compatible” toner brands available in the UK market.

Buyers Lab tested genuine TN-3480 cartridges and 10 compatible brands, using 11 Brother HL-L6300DW printers as test devices. All cartridges were purchased by Buyers Lab on the open market. Each brand was tested on a brand-new HL-L6300DW printer dedicated to a single toner brand to eliminate cross-contamination. All cartridges were run until end of life, using a heavy-coverage mixed test suite (multi-page files consisting of text and graphics, ranging from 2% to 17% page coverage, with an average page coverage of 8.5% over the entire test suite). All failures, including misfeeding/paper jams, printer damage, early end-of-life and out-of-box toner failures, were recorded.

Test methodology: Buyers Lab ran each printer for up to seven hours per day with all output in simplex and duplex mode and one printer assigned to each of the cartridge brands. Batches of 200 pages were sent, with the device allowed to cool for a 5-minute period before the next submission. Each device was run until the all 12 full yield cartridges had been completed. Packaging quality, toner leakages, page yield, impact on device reliability (paper jams), and impact on other key components of the device (fuser, drum) and image quality, have been recorded and evaluated, per the following:

A) Page yield: Page yield was assessed using a mixed suite of low, medium, and high coverage files. Printer model and serial number, as well as cartridge name and type, were recorded prior to the start of testing. End of cartridge life was deemed to have occurred if the printer displayed a “toner out” message, or if image quality had degraded to an unacceptable level, or if the cartridge had caused damage to the printer. A cartridge was considered to have reached end of life at first fade if the manufacturer did not specify a shake procedure, or at the third fade occurrence following two shake procedures in cases in which the manufacturer specifies a shake procedure. Faded pages printed are excluded from the yield count. Throughout testing, each printer was maintained per manufacturer specifications. Once end of life was reached, the cartridge was retired, and a page count was recorded along with a brief description.

B) Reliability: Before starting the testing of the full yield toner cartridges, Buyers Lab exhausted the starter cartridges to ensure all devices were performing correctly. Throughout testing, Keypoint Intelligence-Buyers Lab recorded any packaging and loading issues, cartridge malfunctions (such as mechanical failures, toner leakage), component breakage, background on printed pages, and impact on printer performance (such as damage to fusers). Regular inspections of both drum and fuser surface were carried out to look for wear and tear, with photographs taken as supporting evidence. Cartridges that did not function out of the box, were damaged, or produced 20 or fewer acceptable pages were classified as DOA (dead on arrival) or OOB (out-of-box failures); cartridges yielding less than 75% of manufacturer specified yields were classified as premature expires.

C) Image quality: Image quality (IQ) was monitored throughout the day to detect visual IQ drop off events. In addition, a selection of Buyers Lab objective IQ test samples were collected at the start and after every 1250 impressions. IQ samples were evaluated for clarity and definition of text and line art, optical density, reproduction of halftone images, and toner adhesion. Visual evaluations of IQ samples were conducted under a Graphic Lite D5000 Standard Viewer and Edmund Scientific PL-B776U PixelINK magnifier. Optical density was measured with an X-Rite 508 Series densitometer.

D) Image permanence: Image permanence was evaluated by subjecting the samples to the ASTM F1571 Standard Test Method for Determination of Abrasion and Smudge Resistance of Images Produced from Copy Products (Sutherland Method; three cycles), and by subjecting samples to the ASTM F1351 Standard Practice for Determination of the Effect of Hard Creasing Paper on Images Produced by Business Imaging Systems. Toner adhesion was also tested using the Scotch tape test.

Test environment/conditions: All testing was conducted in BKeypoint-Buyers Lab’s test facility located at Unit 11 The Business Centre, Wokingham, RG41 2QZ, with daily conditions monitored by an Extech RH 520 Humidity and Temperature Digital Recorder and a Honeywell Model 61 Seven-Day Temperature/Humidity Chart Recorder.

Temperature: Test room average, 22°C (+/-2.7°C). Running average temperatures were between 20.0°C and 26.0°C (68°F to 78°F), with data logged on a per-cartridge basis.

Relative Humidity: Testing room average, 50% ± 10% RH. Running average was between 35% and 65%, with data logged on a per-cartridge basis.

Conditioning: Printers, paper and cartridges were acclimated to the above conditions for a minimum of eight hours prior to testing. Prior to acclimation, packaging and shipping materials were opened in a manner that prevented light damage from occurring to the print cartridges. Paper was acclimated in ream wrapper. Printers, printer components, paper and cartridges were handled in a manner that did prevent exposure to condensation.

Serial numbers of Brother HL-L6300DW printer devices

| Toner Cartridge Brand | Serial Number |
|-----------------------|-----------------|
| Brother | E75338A7N544875 |
| Brand B | E75338A7N544883 |
| Brand C | E75338A7N546284 |
| Brand D | E75338A7N546286 |
| Brand E | E75338A7N546282 |
| Brand F | E75338A7N546267 |
| Brand G | E75338A7N546283 |
| Brand H | E75338A7N546309 |
| Brand I | E75338A7N546281 |
| Brand J | E75338A7N546269 |
| Brand K | E75338A7N546279 |

ABOUT KEYPOINT INTELLIGENCE - BUYERS LAB

Keypoint Intelligence is a one-stop shop for the digital imaging industry. With our unparalleled tools and unmatched depth of knowledge, we cut through the noise of data to offer clients the unbiased insights and responsive tools they need in those mission-critical moments that define their products and empower their sales.

For over 50 years, Buyers Lab has been the global document imaging industry’s resource for unbiased and reliable information, test data, and competitive selling tools. What started out as a consumer-based publication about office equipment has become an all-encompassing industry resource. Buyers Lab evolves in tandem with the ever-changing landscape of document imaging solutions, constantly updating our methods, expanding our offerings, and tracking cutting-edge developments.