CANON LASER PRINTER
TONER CARTRIDGES FOR RUSSIA
PRINTS COMPARISON TEST
SUMMARY REPORT

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Canon Laser Printer, Toner Cartridges for Russia Prints Comparison Test Summary Report

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Allion Japan Inc. (below, Allion) conducted its first gas resistance benchmark test in June 2007, comparing prints from inkjet printers using genuine and third party refill ink cartridges that had been subjected to a mixed gas speed test. This test was followed by a series of various benchmark tests, including toner cartridge yield comparison tests, actual environment exposure tests, and usability tests, all from the viewpoint and conditions of users, implemented on ink cartridges sold in Japan and in overseas markets between 2007 and 2013.

This time, as a new experiment, we focused on laser printer toner cartridges. We examined the effects of using two genuine Canon cartridges and third party black toner cartridges on the printer as well as the impact on printed pages. The purpose of the test is to confirm to what extent reliabilities of genuine toner cartridges and third-party toner cartridges are assured, by performing fair tests as a third-party verifier.

In the main text below, genuine toner cartridges are referred to as Canon toner cartridges or Canon genuine for short, and a state of using third-party toner cartridges is referred to as third-party toner cartridges or third-party for short. For identification purposes, Cactus brand toner cartridges are referred to as "Cactus," and Hi-Black brand toner cartridges are referred to as "Hi-Black."

2 Findings

The table below shows the results of prints comparison tests:

Assessment item	Canon genuine	Cactus	Hi-Black
Packing/Unpacking condition assessment	**No problem**	**With toner dispersion**	**No problem**
Initial assessment	**No problem**	**Stain on the image**	**Stain on the image**
Toner cartridge yield assessment	**Refer to the prints ratio on page 6**		
Printed character quality assessment	**No problem**	**Toner dispersion is found around characters**	**Toner dispersion is found around characters**
Printed image quality assessment	**No problem**	**Strong redness on the whole Change in hue**	**Pale hues Streaking appears in printing results**
Notification of remaining life	**Notified**	**Not notified**	**Not notified**

With Canon genuine, faults did not occur in any item. For Cactus and Hi-Black, it was confirmed that failures occurred in each test item. Details of failures are summarized below:

(1) Toner was dispersed when the toner cartridge was unpacked (Cactus).
(2) Stainage occurred on the image during the initial printing immediately after the printer was unpacked (Cactus, Hi-Black).
(3) Poor reproductivity of hue as well as poor stability (Cactus, Hi-Black).
(4) Waste of prints may occur since no toner message is displayed, with the result that fade is not noticed (Cactus, Hi-Black).

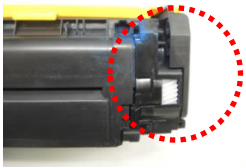
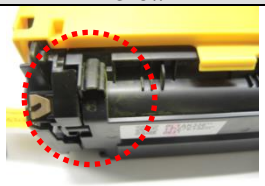
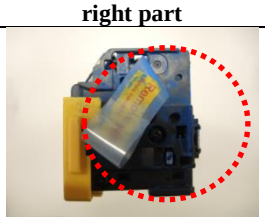
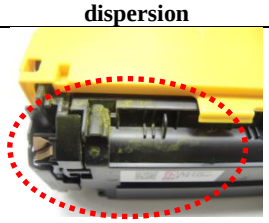
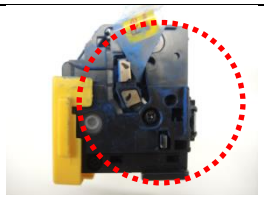
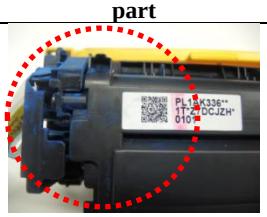
Details of each item are described in the test results in the following pages.

3 Test Results

3.1 Packing/Unpacking Condition Assessment

Packing and initial product conditions were examined, when the Canon genuine, Cactus, and Hi-Black cartridges were unpacked. For the packing conditions including the packages, no failures were observed from any of the companies' toner cartridges. As the packaging conditions were checked, Cactus toner (three cyan toner cartridges, two yellow toner cartridges) was dispersed on the cartridges. Similar failures of toner dispersion did not occur with Hi-Black and Canon genuine.

The following shows images of the toner dispersion when the toner cartridges of Cactus were unpacked.

Cartridge	Cyan		Yellow
Cactus No. 1	 **Toner dispersion on the top right part**		 **Vertical and horizontal toner dispersion**
Cactus No. 2	 **Toner dispersion on the left part**	 **Dispersion was found in the protection bag**	 **Toner dispersion on the top left part**
	 **Toner dispersion on the top left part**		
	 **Toner dispersion on the left of the front part**		
Cactus No. 3	 **Toner dispersion on the left part**	 **Dispersion was found in the protection bag**	
	 **Toner dispersion on the top left part**		

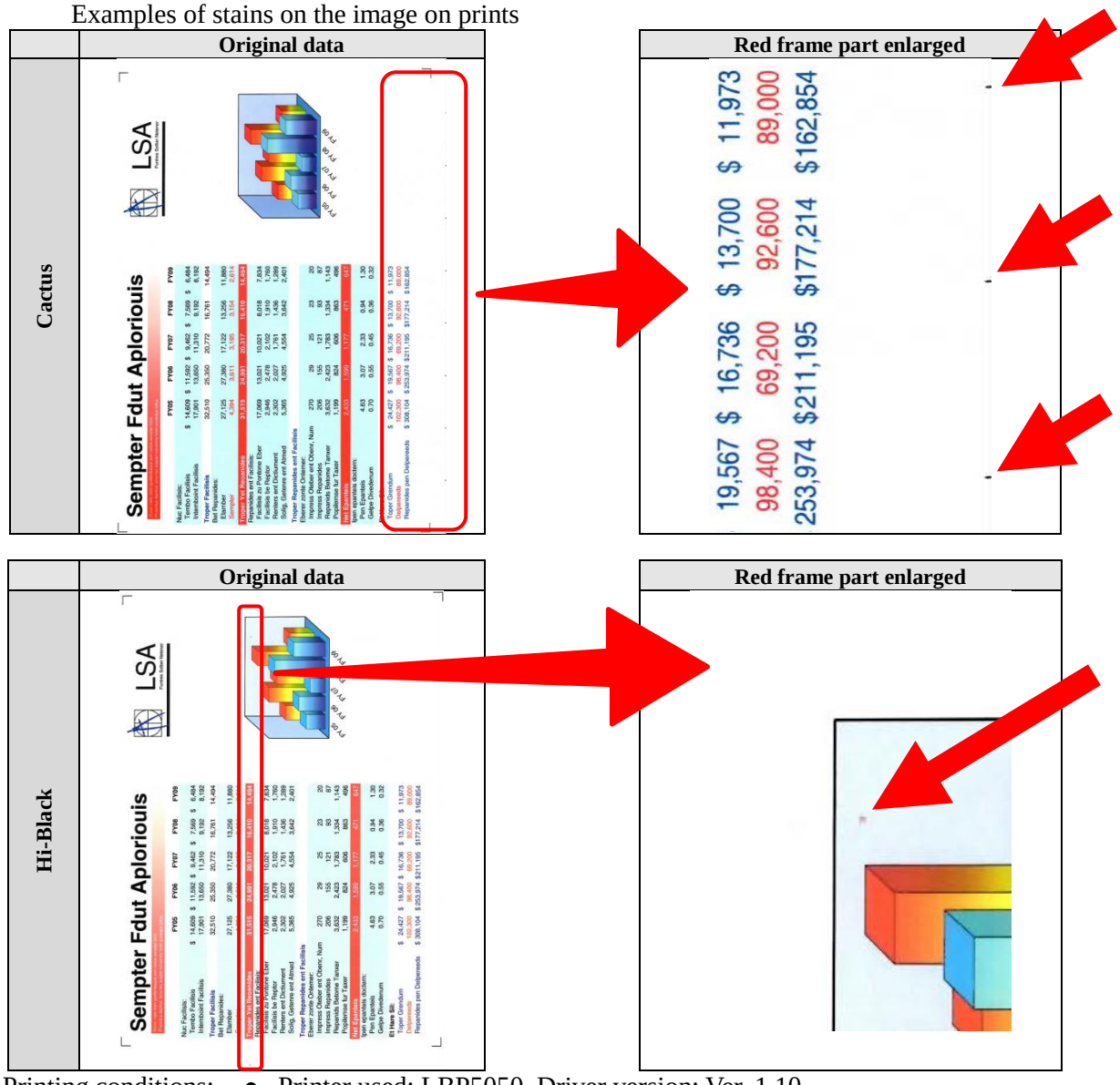
3.2 Initial Assessment (assessment upon installation)

When printing is performed by Canon Color Laser Pinter LBP5050 using each company's toner cartridges, a failure in which vertical regular interval stains on the image were generated occurred on prints using the third-party toner cartridges. With Cactus, stains on the image were vertically generated at regular intervals on the right ends of prints. With Hi-Black toner cartridges, red stains on the image were generated at almost regular intervals at the center of prints (refer to examples of stains on the image on prints in the table below).

This phenomenon failed to improve even after performance of recovery operations (calibration, color shift compensation, and cleaning twice) that are explained in the instruction manual. The phenomenon does not occur with genuine Canon cartridges.

Note that, upon installation of Canon's toner cartridges, no failures occurred in the printer (such as impossibility of putting the cartridge into the printer, an unusual sound, etc.).

Examples of stains on the image on prints



Printing conditions:

- Printer used: LBP5050, Driver version: Ver. 1.10
- Paper used: Snegurochka (laser printer paper, A4)
- Image used: ISO/IEC 24711: 2007 Criteria Chart
- Print settings: Paper setting: Plain paper, Print quality: Normal, Color density: Normal, Page layout: One page per sheet (Normal)

3.3 Toner Cartridge Yield Assessment

Under the following printing conditions, toner cartridge yields were compared until two black toner cartridges were emptied using Canon toner cartridges and third-party toner cartridges. In consideration of discrepancies in the test results due to individual differences in printers, the test was conducted using two printers for each company's toner cartridges. For the number of prints in the table below, the average prints ratio of each color used with two printers until each company's two black cartridges were emptied are recorded.

When a toner replacement error message is displayed from the printer side, the toner cartridges are temporarily removed and shaken once. Then, when printing is performed after the cartridges are put back into the printer again, an occurrence of fade, etc. is checked. If no fade occurs, printing continues until the toner replacement error message is displayed again. Then at the point in time where the error message is displayed for the second time, the toner cartridges are shaken again. If fade still occurs on prints, it is determined that the toner is emptied, and the toner cartridge is replaced.

Each third-party's prints ratio when considering the number of prints of Canon genuine as 100%

Unit: %

	Canon	Cactus	Hi-Black
Black	**100%**	**96%**	**95%**
Yellow	**100%**	**93%**	**102%**
Magenta	**100%**	**91%**	**110%**
Cyan	**100%**	**90%**	**95%**

Printing conditions:

- Printer used: LBP5050, Driver version: Ver. 1.10
- Paper used: Snegurochka (laser printer paper, A4)
- Image used: ISO/IEC 24711: 2007 Criteria Chart
- Print settings: Paper setting: Plain paper, Print quality: Normal, Color density: Normal, Page layout: One page per sheet (Normal)

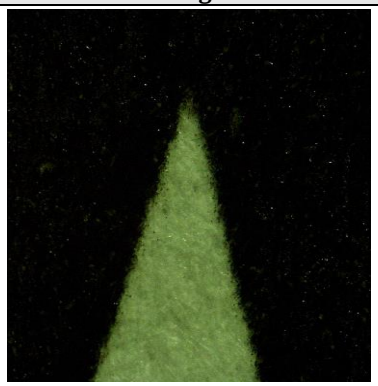
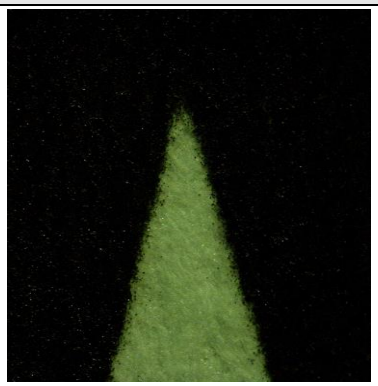
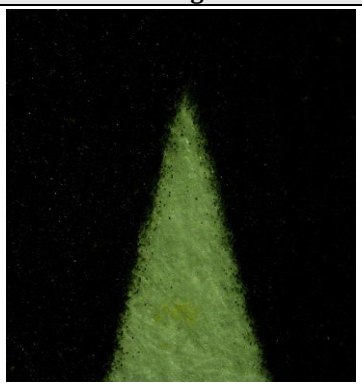
The following results were obtained by comparing the toner cartridge yield test results.
When Cactus was compared with Canon genuine, Canon genuine was able to generate 4% to 10% more prints than Cactus in all colors.
When Hi-Black was compared with Canon genuine, the result revealed that Hi-Black generated more prints in magenta and yellow, however, in black and cyan, Canon genuine generated 5% more prints.

In addition, while implementing the toner cartridge yield test, when consumption of genuine Canon toner reached low levels, a message, "Toner replacement is approaching," was displayed. Then, when the toner reached the end of its life, a message, "Replace toner," was displayed. With each third-party toner cartridge, however, since the printer did not display a message to replace the toner when the toner level was low, fade sometimes occurred suddenly. In addition, when the issue occurred, there was no message warning the user that the cartridge was empty. This resulted in continued printing which leads to wasted paper.

3.4 Printed Character Quality Assessment

The toner cartridge yield assessments were administered under the following printing conditions, when every 500 sheets were printed, a specific document (ISO/IEC 24711: 2007 Criteria Chart) was printed until two black cartridges were emptied. Three positions of the print were checked under an electron microscope to confirm occurrence of failures, such as blurred characters, toner dispersion, etc. For prints that were printed using third-party toner cartridges, toner was dispersed around characters, regardless of the number of prints. For prints that were printed using Canon genuine, no failures were found.

Original data of the specific document	Red frame part enlarged
	

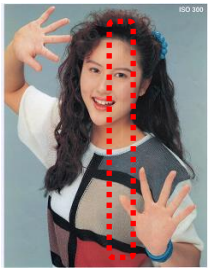
Canon genuine, red frame part enlarged	Cactus, red frame part enlarged	Hi-Black, red frame part enlarged
		
No failure	Dispersed around characters	Dispersed around characters

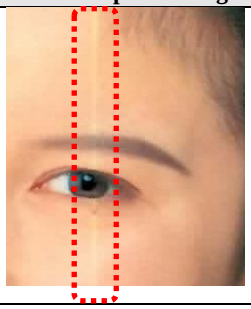
Printing conditions:

- Printer used: LBP5050, Driver version: Ver. 1.10
- Paper used: Snegurochka (laser printer paper, A4)
- Image used: ISO/IEC 24711: 2007 Criteria Chart: Business Letter
- Print settings: Paper setting: Plain paper, Print quality: Normal, Color density: Normal, Page layout: One page per sheet (Normal)

3.5 Print Image Quality Assessment

The toner cartridge yield test was conducted under the printing conditions that every time 500 sheets were printed, a specific document (SCID image, N1A) was printed until two black cartridges were emptied to confirm the printing quality. An issue resulting in a hue change was noted and this caused a loss to the stable tint in the prints. The occurrence of streaking on prints was confirmed when using each third-party toner cartridges. The timing of the change in hue often occurs when the toner cartridge is replaced, which indicates that hue may change by cartridge when a third-party's toner cartridges are used. For prints that were printed using Canon genuine, no failures were found.

Printer	No. of prints	Canon	Cactus	Hi-Black
LBP5050	**After printing the first print**	 After printing 500 sheets	 After printing 500 sheets	 After printing 500 sheets
	After printing halfway	 After printing 2,500 sheets	 After printing 2,500 sheets	 After printing 2,500 sheets
	After printing the number of prints possible	 After printing 4,700 sheets	 After printing 4,000 sheets	 After printing 4,000 sheets
	Results	**Change in hue is not observed.**	**Hue is reddish on the whole. Hue significantly changed in the last print, compared with the first print.**	**Hue is pale on the whole. Streaks are confirmed after printing 4,000 sheets.**

	Red frame part enlarged
Hi-Black	

Printer	Cycle	No. of prints	Canon	Cactus	Hi-Black
LBP5050	1	After printing 500 sheets			
		After printing 1,000 sheets			
		After printing 1,500 sheets			
		After printing 2,000 sheets			
		After printing 2,500 sheets			
		After printing 3,000 sheets			
		After printing 3,500 sheets			
		After printing 4,000 sheets			
		Results	Hue is stable.	Hue changed at 2,500th print. Strong redness on the whole.	Hue is pale on the whole.

Printer	Cycle	No. of prints	Canon	Cactus	Hi-Black
LBP5050	2	After printing 500 sheets			
		After printing 1,000 sheets			
		After printing 1,500 sheets			
		After printing 2,000 sheets			
		After printing 2,500 sheets			
		After printing 3,000 sheets			
		After printing 3,500 sheets			
		After printing 4,000 sheets			
		Results	Hue is stable.	Hue changed at 1,500th print. Color gradually becomes pale.	Hue is pale on the whole.

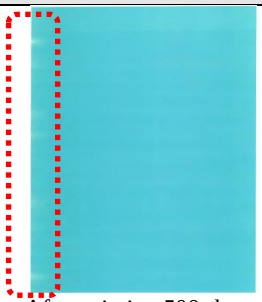
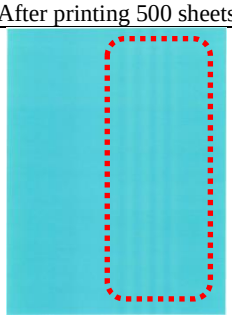
Hue comparison after printing 500 sheets: The images are combined with Canon genuine on the left half, and the third-party on the right half.

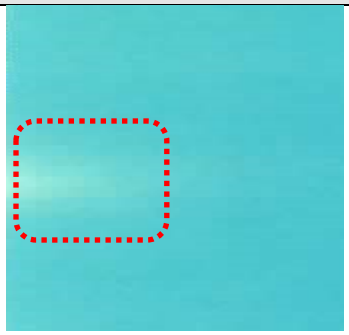
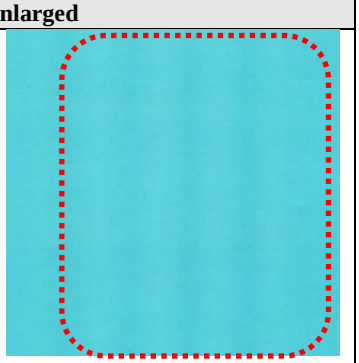
Printer	Canon genuine	Cactus	Hi-Black
LBP5050			
		Compared with the genuine, hue is reddish.	**Compared with the genuine, hue is yellowish.**

Printing conditions:

- Printer used: LBP5050, Driver version: Ver. 1.10
- Paper used: Snegurochka (laser printer paper, A4)
- Data used: SCID image, N1A
- Print settings: Paper setting: Plain paper, Print quality: Normal, Color density: Normal, Page layout: One page per sheet (Normal)

The toner cartridge yield test was administered under the condition that every time 500 sheets were printed, a specific document (SCID image, N1A) was printed until two black cartridges were emptied. After that, a specific document (a solid image) was printed to confirm stability of colors, and it was confirmed that the colors are fixed on prints. In prints printed using the third-party toner cartridges, cross-contaminated colors, uneven color, and streaks occurred, resulting in unstable tint. For prints that are printed using Canon genuine, the same failures did not occur.

Printer	No. of prints	Canon	Cactus	Hi-Black
LBP5050	**After printing the first print**	 After printing 500 sheets	 After printing 500 sheets	 After printing 500 sheets
	After printing halfway	 After printing 2,500 sheets	 After printing 2,500 sheets	 After printing 2,500 sheets
	After printing the number of prints possible	 After printing 4,700 sheets	 After printing 4,000 sheets	 After printing 4,600 sheets
	Results	**No change in hue is observed.**	**Uneven color is confirmed after printing 500 sheets. Yellow is cross-contaminated after printing 4,000 sheets**	**Streaks are confirmed after printing 2,500 sheets.**

	Red frame part enlarged		
Cactus		Hi-Black	

Printing conditions:

- Printer used: LBP5050, Driver version: Ver. 1.10
- Paper used: Snegurochka (laser printer paper, A4)
- Data used: Solid image
- Print settings: Paper setting: Plain paper, Print quality: Normal, Color density: Normal, Page layout: One page per sheet (Normal)

4 Overview of the Test

4.1 Equipment Used

In the comparison assessment, three companies' toner cartridges were tested with one printer (using up two Black CRG per company). For the test method, two printers were used, and each printer tested toner cartridges of the third parties first.

- Printer used: Canon Satera LBP5050 (Driver version: Ver. 1.10)

Name of manufacturer	Printer ID	Serial number of the printer
Canon genuine	1st machine	LYEA019454
	2nd machine	LYEA501148

- Toner cartridges for Canon Satera LBP5050 (procured in Russian market)

Name of manufacturer	Color	Model number
Canon genuine	Black	CARTRIDGE 716 BK
	Yellow	CARTRIDGE 716 Y
	Magenta	CARTRIDGE 716 M
	Cyan	CARTRIDGE 716 C
Cactus	Black	CS-C716BK
	Yellow	CS-C716Y
	Magenta	CS-C716M
	Cyan	CS-C716C
Hi-Black	Black	CB540A
	Yellow	CB542A
	Magenta	CB543A
	Cyan	CB541A

- Sample pictures of the toner boxes

Canon genuine Black	Cactus Black	Hi-Black Black
		

- Number of Canon genuine toner cartridges used

Type of toner	1st machine	2nd machine
BK	Two	Two
Y	Three	Three
M	Three	Three
C	Three	Three

- Number of Cactus toner cartridges used

Type of toner	1st machine	2nd machine
BK	Two	Two
Y	Three	Three
M	Three	Three
C	Three	Three

- Number of Hi-Black toner cartridges used

Type of toner	1st machine	2nd machine
BK	Two	Two
Y	Three	Three
M	Three	Three
C	Three	Three

- Paper used for assessment (procured in Russian market)

Name of manufacturer	Name of paper
Snegurochka	Plain paper, A4 size

- Data used: SCID image N1A, solid image (for printing of image quality assessment)

SCID image
 N1A.tif * Japanese Standards Association, Graphic technology-Prepress digital data exchange-CMYK Standard colour image (CMYK/SCID) JIS X 9201:2001

Solid image
 Solid image.pdf

- Data used: ISO/IEC 24711 data (for printing of toner cartridge yield assessment), Business Letter (for printing of document quality assessment)

ISO/IEC 24711: 2007 Criteria Chart

Business Letter

Spreadsheet

Newsletter

Slide

Diagnostic

* From International Standard ISO/IEC 24711: 2007

- Digital Microscopes

Name of manufacturer	Name of each part	Model number
KEYENCE	Controller	VH-S30
	Lens	VH-Z100W
	Casing	VH-5500

4.2 Printing Conditions

- Printer: Canon Satera LBP5050
- Software and setting conditions

Item of condition	Standard value, details
Type of OS and its version	Microsoft Windows 7 Home Premium (Japanese version)
Applications and their versions	Adobe Acrobat Reader 10: Toner cartridge yield assessment, document quality assessment Windows Photo Viewer (Packaged with the above Windows OS): Image quality assessment
Printer driver version	Ver. 1.10
Setting conditions of the printer driver and the applications	<When assessing toner cartridge yield and document quality> Paper setting: Plain paper Printing quality: Normal Color/density: Normal Paper size: A4 Page layout: One page per sheet (Normal) Printing application: Adobe Acrobat Reader 10 <When assessing image printing> Paper setting: Plain paper Printing quality: Normal Color/density Normal Paper size: A4 Page layout: 20.3 x 25.4 Printing application: Windows Photo Viewer (Packaged with the above Windows OS)

4.3 Test Procedures

4.3.1 Packaging/Unpacking Condition Assessment

(1) Check conditions of appearance of the toner box.
(2) Take out the toner from the box, and take pictures of the toner cartridge when it is unpacked (the front part, the back part, the top part, the bottom part, the right side, and the left side).
(3) Confirm whether toner is dispersed when unpacking.

4.3.2 Installation Condition Assessment

(1) Check that the cartridge can be put into the printer.
(2) Check for unusual sound during printing.
(3) Check whether toner is dispersed.
(4) Check whether toner is deposited on the fuser.
(5) Check for a failure caused by the cartridges.
(6) Check for abnormal operation, such as an error signal from the printer, etc., during the printing.

4.3.3 Toner Cartridge Yield Assessment

(1) Put toner cartridges of each color (black, cyan, magenta, yellow) into the printer.
(2) Print ISO/IEC 24711: 2007 Criteria Chart until each color's toner runs out (* fade image).
(3) If fade occurs, stop the operation to perform the recovery operation in accordance with the instruction manual provided with the printer.
(4) If it is not recovered after performing the recovery operation, replace with a new toner cartridge.
(5) Print by following the above procedures until two black toner cartridges (guideline of the toner cartridge yield of 4,600 sheets) are emptied for confirmation.

* Judgment is based on "Examples of Fade (Fade of 3 mm or above)" shown in ISO/IEC 19752:2004 "Information technology - Method for the determination of toner cartridge yield for monochromatic electrophotographic printers and multi-function devices that may contain printer components."

4.3.4 Printed Character Quality Assessment

(1) Print until two black toner cartridges (guideline of the toner cartridge yield of 4,600 sheets) are emptied for confirmation.
(2) Print the specific document every time 500 sheets are printed.
(3) Fix three positions around character to be assessed on prints, and compare quality of characters in the image saved, under an electron microscope.

4.3.5 Printed Image Quality Assessment

(1) Print until two black toner cartridges (guideline of the toner cartridge yield of 4,600 sheets) are emptied for confirmation.
(2) Print the specific image each time 500 sheets are printed.

5 Important: Notes on This Report

This is an original report created by Allion Japan Inc. (Shinagawa, Tokyo) specialized in testing IT equipment to introduce product benchmark tests.
Allion Japan Inc. is responsible for the above test result.

<Disclaimer>

The report samples were obtained using products bought arbitrarily from the market. This report does not guarantee results nor assume quality assurance on the products used in this test. Note that the test result may differ depending on the test conditions and sample.

The readers of this report are responsible for their own judgment based on the result of this test and we will take no responsibility for any secondary damage caused in any way by the use of this report.

For questions or opinions about this report or inquiries about tests, please contact Allion Japan Inc. below. Please let us know of any requests for tests or questions. We accept opinions and questions about the test contents, but it may take time to answer them.

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