



Color Printer

Paper / Media
Technical - Educational
Guide

OKI Data Americas, Inc.
Revision: 5.0

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
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Table of Contents

Basic Media Types and Properties:

Uncoated Paper	Page 3
Coated Paper	Page 4
Specialty Paper	Page 5
Basic Films	Page 5
Paper Properties	Page 6

Technical Reference Information:

Basis Weight Reference Chart	Page 7 (A)
Paper Size	Page 8 (B)
Paper Specification/Measurable Properties	Page 9 (C)
Paper Specification/Card Stock	Page 10 (D)
Labels	Page 11 (E)
Transparencies	Page 11 (F)
Glossy and Matte Imaging/Photo Papers	Page 12 (G)
Envelopes	Page 12 (H)
Inks (Pre-Printed Media)	Page 13 (G)
Perforations and Die-Cuts	Page 13 (J)
Temperature/Moisture Conditioning of Paper	Page 14 (K)

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

Basic Media Types and Properties

In order to understand fully what requirements have to be met by the paper, it is important that you know the characteristics that distinguish the paper types.

Media Types	Uncoated Paper	Uncalendered	Paper composed of pulp, containing cellulose, fibers, binders, pigments, etc. and not submitted to the calendering process. Generally the paper surfaces are rough.
		Calendered	During the calendering process the paper passes through a number of calendering rolls made of steel, in order to make it more compact and smoother by increasing influences of temperature and pressure onto the paper. <u>Economical Bond paper, provides a high white-point for generally low-ink coverage requiring high-contrast. Perfect for presentations and short-term signage.</u> <u>Heavyweight Bond has the added design capability to accept heavy-ink coverage and can be used for point-of-purchase, indoor signage and posters.</u>
		Supercalendered	During the supercalendering process the paper passes through a number of super calenders made alternately of steel and cotton, in order to make it even more compact and smoother. <u>Premium Bond paper, is ultra-white providing very high-contrast and generally low-ink coverage for text, line art presentation and point-of-purchase prints.</u> <u>Premium Heavyweight Bond has the added design capability to accept heavy-ink coverage and can be used for point-of-purchase, indoor signage and posters.</u>

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

Basic Media Types and Properties (continued)

Media Type	Coated Paper	Coating Production Methods	<p><u>Machine Coated Paper</u>: Coating is applied by means of a dosing roll and the excess of coating is removed with a scraper. The gloss is achieved by calendering and the coating thickness is variable on the scale of the paper's relief.</p> <p><u>Cast Coated Paper</u>: The gloss is obtained by passing the paper over a very smooth chromium roll. This results in very high-gloss coated paper and the coating thickness is uniformly the same everywhere.</p>
		Matt	<p>Coated paper, which was not submitted to the calendering process, or which passed through only one pair of calenders. <u>Matte paper has a low glare finish, viewable from sharp angles, designed for text, line art presentations, point-of-purchase and posters. Photo Matte has a special coating to permit high-ink coverage.</u></p>
		Satin	<p>Coated paper, which was submitted to the calendering process. <u>Satin or Semi-Gloss paper has a non-glare or low-glare luster coating for photo and graphic images that require deep, rich colors.</u></p>
		Gloss	<p>Coated paper, which was submitted to the supercalendering process. <u>Gloss paper is designed for high-impact graphic and solid color prints requiring heavier ink coverage used in point-of-purchase, posters, etc.</u></p>
		High-gloss	<p>Coated paper, which was submitted to the supercalendering process. <u>High-Gloss or Mirror gloss paper has an ultra-sheen and extraordinary luster for high-impact photographic images and bright graphics with vibrant colors.</u></p>

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

Basic Media Types and Properties (continued)

Media Types	Specialty Paper	Embossed	Paper with an amount of relief that is produced by pressing it between a rotary embosser, such as, a metal roll containing a pattern.
		Watermarked	Similar to an embossing roller, paper that is still very wet in the paper machine, is processed. This causes thickness variations that create different transparency levels (lighter and darker).
		Recycled	Paper that is made of pulp containing fibers of paper that has already been used and to which new fibers are added. Sometimes all fibers are recycled.
		Tinted & Colored	Paper that is made of pulp containing an amount of pigments. Colored paper has more saturated color than tinted. paper.
		Translucent	Paper that is highly transparent due to a special way of crushing the fibers.
		Parchment	Parchment paper was originally made from the skin of a goat or sheep. Today, parchment paper has been manufactured so that its appearance looks like the mottled opacity of the original media.

Media Types	Basic Films	Film Properties	Many different kinds of films are used in the print industry. Like paper, films can also be coated for better printability or for obtaining a glossy look. Corona treatment and chemical treatment are also used to improve printability. Films are getting more popular, due to several reasons. Films are more durable than paper: they have longer lifetime in outdoor applications (influence of rain, salt water, UV-radiation, heat), some of them are very resistant against chemicals and others have superior mechanical properties (high tear resistance, high flexibility).
		PP (polypropylene)	Properties include; inexpensive, high flexibility, moderate durability. Applications include; self-adhesive labels, in mold labeling, “synthetic paper”, all kinds of cards.
		PET (polyethylene terephthalate or polyester)	Properties include; very durable and expensive. Applications include; self-adhesive labels, long-life outdoors labels, labels requiring resistivity against very high temperature.

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

Basic Media Types and Properties (continued)

Paper properties that mainly determine its final application:

Weight *	Weight of the paper expressed in grams per square meter (g/m^2).
Caliper *	Thickness of the paper expressed in μm .
Absolute moisture content	The ratio between the total amount of water in the paper and the weight of the paper.
Relative moisture content	Equals the relative humidity of the surrounding air, in equilibrium with the paper.
Smoothness *	A roughness value defining the size of tips and valleys on the paper surface measured in Sheffield, Bekk, Bendtsen, PPS μm .
Brightness *	Total amount of visible light reflected by the paper. Paper brightness is necessary to provide high-contrast images.
Bulk *	A measure of thickness in terms of the number of pages per inch for a given basis of weight.
Formation	This depends on the structure of cellulose fibers, which, in turn, depends on the construction of the paper machine and the composition of the pulp.
Opacity *	The lower the opacity, the better you can look through the paper. Thin papers usually have a lower opacity.
Gloss *	The amount of incident light under a certain angle that the paper reflects with the same angle.
Bulk/volume resistivity *	Measured across the front and back surface of the paper. The inverse is bulk or volume conductivity.
Surface resistivity *	Measured on one side of the paper. The inverse is surface conductivity.

* denotes that these properties also apply to films.

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

(A) Basis Weight Reference Chart:

* = That particular weight of paper is not generally available.

Grams per Square Meter, (g/m ²)	Basis Weight per 500 sheets Pounds (lb.)/Ream					
	All Paper Types (metric weight) Base Sheet →	US Bond Writing Weight, (lbs.) 17" x 22"	US Text Print Weight, (lbs.) 25" x 38"	US Cover Weight, (lbs.) 20" x 26"	US Index Bristol Weight, (lbs.) 25½" x 30½"	US Vellum Bristol Weight, (lbs.) 22½" x 28½"
59	*	40	*	*	*	*
60	16	*	*	*	*	*
62	*	42	*	*	*	*
65	*	*	*	*	*	40
67	*	45	*	*	*	*
68	18	*	*	*	*	*
74	*	50	*	*	*	*
75	20	*	*	*	*	*
81	*	55	*	*	*	50
89	*	60	*	*	*	*
90	24	*	*	*	*	*
98	*	*	*	*	*	60
104	*	70	*	*	*	*
105	28	*	*	*	*	*
108	*	*	40	*	*	*
111	*	75	*	*	*	*
114	*	*	*	*	*	70
118	*	80	*	*	*	*
120	32	*	*	*	*	*
125	*	*	*	*	57	*
130	*	*	*	72	*	80
133	*	90	*	*	*	*
135	36	*	50	*	*	*
146	*	*	*	*	*	90
147	*	*	*	*	67	*
148	*	100	*	*	*	*
150	40	*	*	*	*	*
161	*	*	*	*	*	99
162	*	*	60	*	*	*
163	*	*	*	90	*	100
165	44	*	*	*	*	*
175	*	*	*	*	80	*
176	*	*	65	*	*	*
177	47	*	*	*	*	*
178	*	120	*	*	*	*
179	*	*	*	*	*	110
189	*	*	70	*	*	*
195	*	*	72	*	*	*

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

(A) Basis Weight Reference Chart: (continued)

Grams per Square Meter, (g/m ²)	Basis Weight per 500 sheets Pounds (lb.)/Ream					
	All Paper Types (metric weight) Base Sheet →	US Bond Writing Weight, (lbs.) 17" x 22"	US Text Print Weight, (lbs.) 25" x 38"	US Cover Weight, (lbs.) 20" x 26"	US Index Bristol Weight, (lbs.) 25½" x 30½"	US Vellum Bristol Weight, (lbs.) 22½" x 28½"
197	*	*	*	*	90	*
199	53	*	*	110	*	*
203	*	*	*	*	*	125
216	*	*	80	*	*	*
219	*	*	*	*	100	*
226	*	*	*	125	*	*
244	*	*	*	*	*	150
253	*	*	*	140	*	*
263	*	*	*	*	120	*
270	*	*	100	*	*	*
274	*	*	*	*	125	*
285	*	*	*	*	*	175
307	*	*	*	170	140	*
325	*	*	120	*	*	200

Conversion: (1) From basis weight in pounds (lbs.) to grams per meter square (g/m²). Multiply the basis weight by 1406.13 and divide by the square inches in the base sheet size. (2) 64 (g/m²) = 55 Kg

(B) Paper size:

1. Standard:
 - Letter, 8.50" x 11.00"
 - Legal 14, 8.50" x 14.00"
 - A4, 8.27" x 11.69"(210 x 297 mm)
 - B5 (JIS), 7.17" x 10.12"(182 x 257 mm)
 - Legal 13, 8.50" x 13.00"
 - Executive, 7.25" x 10.50"
 - A5, 5.83 x 8.27"(148 x 210 mm)
 - A6, 4.13" x 5.83"(105 x 148 mm)
2. Wide Format:
 - B4, 10.12" x 14.33"(257 x 364 mm)
 - A3, 11.69" x 16.54"(297 x 420 mm)
 - A3 Nobi, 12.9" x 17.83"(328 x 453 mm)
 - Tabloid, 11.00" x 17.00"
 - A3 Wide, 12.6" x 17.7"(320 x 450 mm)
 - Tabloid Extra, 12.00" x 18.00"
3. Envelopes:
 - Comm-9, 3.875" x 8.875"
 - Monarch, 3.9" x 7.5"
 - Comm-10, 4.125" x 9.50"
 - C4 SEF, 9.00" x 12.80"
 - DL, 4.30" x 8.70"
 - C5, 6.40" x 9.00"

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

(C) Paper Specification/Measurable Properties:

A grade of paper that is generally suitable for printing by the electrographic process is usually made from chemical wood pulps and characterized by smooth finish, heat stability, non-curling qualities and good aesthetic properties such as color, brightness and cleanliness.

1. Basis weight:
 - 17 ~ 54 lb. (US Bond) -- 64 ~ 203 g/m²
 - 45 ~ 120 lb. (US Text) -- 67 ~ 178 g/m²
 - 40 ~ 72 lb. (US Cover) -- 108 ~ 195 g/m²
 - 72 ~ 110 lb. (US Index) -- 130 ~ 199 g/m²
 - 57 ~ 90 lb. (US Vellum Bristol) -- 125 ~ 197 g/m²
 - 40 ~ 110 lb. (US Tag) -- 65 ~ 179 g/m²
2. Caliper Paper Standard Paper Cassette(1st):
 - 0.003” to 0.0055” (0.08 to 0.13 mm)
3. Optional Paper Cassettes:
 - 0.003” to 0.0055” (0.08 to 0.13 mm)
4. Front feeder:
 - 0.003” to 0.009” (0.08 to 0.23 mm)
5. Curl In-ream:
 - Flat within 0.2”
6. Cut Edge Conditions:
 - Cut with sharp blades, no visible fray, burrs, jagged edges, dust, chaffing;
Note: paper exhibiting any of these defects may not be used.
7. Finishing (Precision):
 - Cut sheet to within 0.03 inch (vs. 8.5”) of nominal 0.2° square.
8. Furnish (Fiber Composition):
 - 100% chemical wood pulp and/or cotton fiber.
(Recycled Paper must be electrographic printer compatible, equivalent to “virgin fiber” papers.)
9. Fusing Compatibility:
 - Must not scorch, melt, offset, or release hazardous emissions when heated to 446°F (230°C) for 0.2 second.
10. Grain Orientation:
 - Long grain is preferred for 59 to 105 g/m² (16 to 28 lb. US Bond or equivalent) with auto-tray or manual feed and to 176 g/m² (47 lb. US Bond or equivalent) with manual feed.
 - Short grain is preferred for >176 g/m² (>47 lb. US Bond or equivalent) with manual feed.
11. Packaging:
 - Poly laminated moisture-proof ream wrap and Shelf Life must exceed one(1) year in storage conditions up to 122°F (50°C) and 90 % RH without altering the original properties of the paper.

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

(C) Paper Specification/Measurable Properties: (continued)

- 12. Finish (Smoothness):
 - 40 to 170 (Sheffield); for paper weights >135 g/m² more than 80 (Sheffield) is recommended.
- 13. Acidity:
 - 6.0 pH minimum, for extended document retention periods a pH minimum of 7.0 preferred.
- 14. Alkalinity:
 - 8.0 pH maximum, for extended document retention periods additional content should include 2 % calcium or magnesium carbonate filler.
- 15. Moisture Content:
 - 4.0 to 8.0 % volume by weight
- 16. Electrical Surface Resistivity:
 - 10⁹ to 10¹⁴ ohms/sq. inch (conditioned at 22.8°C/50% RH)
- 17. Electrical Volume Resistivity:
 - 10¹¹ to 10¹² ohms/cm (conditioned at 22.8°C/50% RH)
- 18. Surface Strength:
 - 12A Wax Pick minimum (Dennison)
- 19. Stiffness:
 - 1.6 to 7.5 machine direction, 0.6 to 3.5 cross direction (Taber)
 - Print Direction: 90 ± 25, Cross Direction: 40 ± 15 (Clark)
- 20. Opacity:
 - 85 % minimum (Hunter brightness test method), >90 % preferred or for duplex printing.
- 21. Brightness:
 - 84 % minimum, >89 %, Neutral White preferred.

(D) Paper Specification/Card Stock:

In addition to the specification items in section (C) all of the following applies to Cover, Index Bristol, Vellum Bristol, Text Print and Tag papers.

- Card stock can generally have a wide variety of constructions and the orientation of the grain direction, moisture content, thickness, texture and other properties can significantly impact printing. Therefore, the preferred construction is a single-ply, 100 % chemically pulped wood with a Vellum finish (is relatively absorbent to provide good toner adhesion and feed reliability). In this paper grade/class glossy coatings, slick surfaces or laid type finishes should be avoided.
- Grain Orientation affects card stock rigidity and feed reliability. The preferred grain orientation is dependent on the feed direction, short edge or long edge, and the metric weight (g/m²).
 - Short edge is fed first, then Short Grain is preferred for metric weights >135 g/m² with manual feed and long grain is preferred for metric weights ≤135 g/m² with manual or auto-tray (≤105 g/m²) feed.
 - Long edge is fed first, then Long Grain is preferred for metric weights >135 g/m² with manual feed and short grain is preferred for metric weights ≤135 g/m² with manual or auto-tray (≤105 g/m²) feed.

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

(E) Labels:

In addition to the specification items in section (C) all of the following applies to adhesive type Full Label Sheets.

- Full label sheets are composed of three(3) basic parts that include the face sheet (printable surface), adhesive and liner or carrier sheet.
 - Full label sheet construction implies that the entire carrier sheet is covered leaving no exposed areas or spaces, except for labels specifically designed to leave a margin around the outside that corresponds to the outer margins of the printable area.
 - Face sheets must be compatible with electrographic/photocopy papers that meet or exceed the section (C) specification criteria and provide good toner adhesion. Topcoats, water or solvent based, are not recommended.
 - The face sheet (with or without a topcoat), carrier sheet, adhesive and other materials must withstand the 446°F (230°C) temperature for 0.2 seconds including mechanical pressures to 25 psi encountered during the fusing process. All of these materials must not discolor, melt, offset or shift, release hazardous emissions that exceed exposure levels or threshold limits established by OSHA and other worldwide safety agencies.
 - Adhesives must not be exposed on any external surfaces of the label and they may not come in contact with any part of the printer, before, during or after printing. Label construction or die-cutting must not allow individual labels to peel off, shift, dog-ear or alter the original positioning during transport, printing or fusing.
 - Finish (Smoothness): 100 to 170 Sheffield.
 - Packaging must include moisture-proof wrap and Shelf Life must exceed one(1) year in storage conditions up to 122°F (50°C) and 90 % RH without altering the original properties of the Label stock.

(F) Transparencies:

In addition to the specification items in section (C) all of the following applies to Overhead Transparencies used on overhead projectors(OHP).

- Overhead transparencies must be specifically designed/formulated for use with color LED/laser electrographic printers.
 - Caliper: • 3.9 mils to 5.0 mils (0.10 mm to 0.13 mm)
 - Electrical Surface Resistivity: • 10^{11} to 10^{12} ohms/sq. inch (conditioned at 22.8°C/50% RH)
 - Finishing (Precision): • Cut sheet to within ± 0.03 inch (± 0.8 mm) of nominal, 90° corners 0.2°
 - Packaging must include moisture-proof wrap and Shelf Life must exceed one(1) year in storage conditions up to 122°F (50°C) and 90 % RH without altering the original properties of the Overhead Transparency materials.

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

(F) Transparencies: (continued)

- The Overhead Transparency materials, adhesive strip and other materials or coatings must withstand the 446°F (230°C) temperature for 0.2 seconds including mechanical pressures to 25 psi encountered during the fusing process. All of these materials must not discolor, melt, offset or release hazardous emissions that exceed exposure levels or threshold limits established by OSHA and other worldwide safety agencies.

(G) Glossy and Matte Imaging/Photo Papers:

* OKI Color Products do not currently support “Glossy” media. Please contact our Support Department at 1(800)OKI-DATA (654-3282) for the latest information. If glossy media is used, please try a small quantity to determine if it is suitable for your needs.

In addition to the specification items in section (C) all of the following applies to Glossy and Matte Imaging/Photo Papers used for high-quality color business communications printing.

- Glossy and Matte Imaging/Photo Papers must be specifically designed/formulated for use with color LED/laser electrographic printers and optimized for superior results when printing color graphics and color photos.
 - Acidity: • 7.0 pH, Acid Free for extended document retention periods.
 - Brightness: • 94 % minimum
 - Opacity: • 90 % minimum
 - Finish (Smoothness): • 40 to 100 (Sheffield)
 - Coating: • Specially coated, both sides.
 - Weight: • 28 lb. Bond (105 g/m²) minimum, 32 lb. Bond (120 g/m²) preferred, Ideal for Two-Sided (Duplex) printing.
 - Packaging must include moisture-proof wrap and Shelf Life must exceed one(1) year in storage conditions up to 122°F (50°C) and 90 % RH without altering the original properties of the Glossy and Matte Imaging/Photo Papers.
 - The Glossy and Matte Imaging/Photo materials and other materials or coatings must withstand the 446°F (230°C) temperature for 0.2 seconds including mechanical pressures to 25 psi encountered during the fusing process. All of these materials must not discolor, melt, offset or release hazardous emissions that exceed exposure levels or threshold limits established by OSHA and other worldwide safety agencies.

(H) Envelopes:

In addition to the specification items in section (C) all of the following applies to Envelope Papers used for high-quality color business communications printing.

- Envelopes must be specifically designed/formulated for use with color LED/laser electrographic printers.
 - Basis Weight: • 17 to 28 lb. Bond (64 to 105 g/m²) single sheet.

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc

Revision 5.0

(H) Envelopes: (continued)

- Finish:
- Fold Accuracy, $\pm 0.04''$, Edge, two(2) thickness maximum, all folds must be well scored, sharply creased, tight construction.
- The Envelope materials, adhesive and other materials or pre-printed inks must withstand the 446°F (230°C) temperature for 0.2 seconds including mechanical pressures to 25 psi encountered during the fusing process. All of these materials must not discolor, melt, offset or release hazardous emissions that exceed exposure levels or threshold limits established by OSHA and other worldwide safety agencies.
- Packaging must include moisture-proof wrap and Shelf Life must exceed one(1) year in storage conditions up to 122°F (50°C) and 90 % RH without altering the original properties of the Envelopes.

(I) Inks and Coloration's: (Pre-Printed Media)

In addition to the specification items in section (C) all of the following applies to Inks for pre-printed media used for high-quality color business communications printing.

- Inks and coloration's for pre-printed media must withstand the 446°F (230°C) temperature for 0.2 seconds including mechanical pressures to 25 psi encountered during the fusing process. All of these materials must not discolor, melt, offset or release hazardous emissions that exceed exposure levels or threshold limits established by OSHA and other worldwide safety agencies.
- All pre-printed inks and coloration's must be thoroughly dry before using the printed materials. The use of offset powders or other foreign materials to speed drying is prohibited. Inks and coloration's receptive to UV (ultraviolet) or EB (electron beam) curing processes are typically recommended (check with your vendor or converter to determine if the ink is compatible with electrographic printing).
- All pre-printed inks and coloration's must be abrasion resistant to minimize ink dust and ink contamination that may result in degraded printer performance or damage to sensitive printer components.
- Avoid thermograph inks having a waxy feel or if the image is raised above the substrate (print) material. These inks can melt and damage the printer fuser assembly.

(J) Perforations and Die-Cuts:

In addition to the specification items in section (C) all of the following applies to perforated and die-cut media used for high-quality color business communications printing.

- Perforations or die-cuts should be ironed so that the print material lies flat. Make sure that paper chaff and dust created during the conversion process are removed (thoroughly cleaned).
- Perforations or die-cuts may weaken the strength of the media, which may cause forms tearing or increase the printers jam rate, skew, double feeding or if tenting occurs may cause smearing of the toner before fusing.

OKI Color Printer – PAPER/Media Technical – Educational Guide

OKI DATA Americas, Inc
Revision 5.0

(K) Temperature/Moisture Conditioning of Paper:

- Table:

Hours Required to Temperature/Moisture Condition Paper								
Cubic Volume of Paper on a Skid, in a Case or in a Roll	Difference in Temperature of Paper and Temperature or Room in which the Paper is Opened							
	10°F	15°F	20°F	25°F	30°F	40°F	50°F	60°F
	(Hours Paper Should Stand)							
6 Cubic ft.	5	9	12	15	18	25	35	54
12 cubic ft.	8	14	18	22	27	38	51	78
24 Cubic ft.	11	16	23	28	35	48	67	100
48 Cubic ft.	14	19	26	32	38	54	75	109
96 Cubic ft.	15	20	27	34	41	57	79	115

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