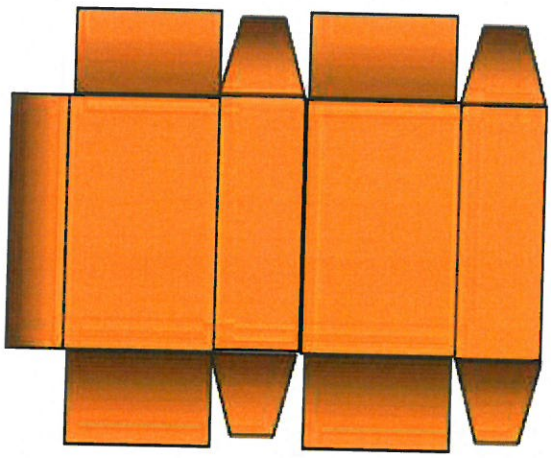
Kraftpak®



Performance and Converting Guide

KAPSTONE

Charleston Kraft, LLC 2010

KapStone Kraftpak® Folding Carton Board
Product Description and Converting Recommendations

Introduction

Kraftpak Folding Carton Board is a low density, high-strength, unbleached and uncoated natural kraft fiber paperboard. Kraftpak is an exceptional performer for folding cartons and similar end uses, with a strategically designed two ply design providing optimum strength for a given amount of fiber, and a consistent top surface which contributes to the distinctive natural brown appearance and printability.

Representative End Uses

Kraftpak is used in the manufacture of:

- Retail Packaging – Quick Serve Cartons, bakery cartons, gift boxes, bottle and cup carriers, mailers (cartons and envelopes) and overwrapped cartons.
- Institutional Food Packaging – Juice and yogurt trays, breaded chicken and fish cartons, frozen confectioneries packers, and military MRE cartons.
- Industrial Packaging – Packer cartons, filter frames, electrical component cartons, automotive parts cartons, copier supply cartons, fastener cartons.
- Kraftpak is often polycoated for retail and institutional food cartons, roll headers, separators, and partitions.
- As a base substrate for adhesive and poly laminations using unprinted and preprinted bleached paper/board, single-face laminations, films and foils – food, beverage and personal care products.

Properties of Kraftpak Folding Carton Board

Board Properties

Two ply construction with the primary or base layer predominantly comprised of long, thick pine fibers. These fibers are strong and tough, particularly when compared to recycled fibers. This base layer has a relative open pore structure and provides the high bulk and strength properties of the sheet. The secondary, or top, layer is made mostly of shorter, thinner and more highly-refined hardwood fibers. This layer provides a consistent clean surface, treated with a special calendering process, which contributes to the printability. The top surface has a tighter pore structure than the base layer of the sheet and provides more resistance to air permeability, glue penetration and ink holdout.

- Low-density/high yield: This provides optimum strength at a given basis weight, less fiber for a given caliper, more surface area (cartons) per ton, less weight enters the recycled waste stream.
- Clean, uniform appearance, low bacteria count.
- Caliper, basis weight and moisture uniformity promotes excellent and reliable converting performance
- Excellent stiffness and tear, tensile and internal bond strength properties.
- Internally sized for moisture resistance.
- Controlled curl and coefficient of friction for consistent sheet feeding.
- Brightness controlled for improved appearance uniformity.

Certifications: FDA, ISEGA, CONEG, NAFTA, Proposition 65, Kosher, ISO 9001-2000, SFI, PEFC

Kraftpak® Typical Property Values

Grade Availability & Typical Properties (US)

Grade Availability by Caliper

Caliper (in)	0.013	0.015	0.017	0.018	0.020	0.022	0.024	0.026	0.028	0.030	0.032*	0.034*	Units	Method
Basis Weight	46	46	50	53	58	63	68	73	79	84	92	98	lb/1000 sq ft	T-410
Moisture	6.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	percent	T-412
Gurley Porosity	20	14	14	16	16	18	20	22	24	24	26	26	sec	T-460
Taber Stiffness, MD, 15 deg	80	110	150	180	230	300	385	485	600	705	830	925	g-cm	T-489
Taber Stiffness, CD, 15 deg	32	45	60	75	95	125	160	195	250	300	340	380	g-cm	T-489
Taber Stiffness, GM	51	70	95	116	148	194	248	308	389	458	531	593	g-cm	T-489
Cobb, Top, 2 min	45	45	45	45	45	45	45	45	45	50	50	50	g/m2	T-441
Cobb, Bottom, 2 min	50	50	50	50	50	50	50	50	50	50	50	50	g/m2	T-441
Scott Internal Bond	100	100	100	100	100	100	100	100	100	100	100	100	ft-lb/m sq ft	T-596
Coefficient of Friction (COF)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	T-815
Curl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	KapStone	KapStone
GE Brightness	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	percent	T-452
Smoothness, Felt	300	340	350	355	365	370	375	375	380	385	390	390	mL/min	T-538
Smoothness, Wire	385	420	420	420	420	420	420	420	420	420	420	420	mL/min	T-538
Elmendorf Tear, MD	315	325	370	390	435	505	555	590	620	655	670	685	gf	T-414
MD Tensile	70	80	90	95	102	110	115	118	122	125	135	140	lb/in	T-494
CD Tensile	40	42	45	47	50	55	58	60	63	68	74	77	lb/in	T-494

* designates non-standard grade that is not run during every Kraftpak run and has trim and minimum volume requirements

Grade Availability & Typical Properties (Metric)

Grade Availability by Weight

Caliper	330	381	431.8	457.2	508	558.8	609.6	660.4	711.2	762	812.8*	863.6*	Units	Method
Basis Wt.	225	225	244	259	283	307	332	356	386	410	450	479	microns	T-411
Moisture	6.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	gsm	T-410
Gurley Porosity	20	14	14	16	16	18	20	22	24	24	26	26	percent	T-412
Taber Stiffness, MD, 15 deg	7.6	10.5	14.3	17.2	22.0	28.7	36.8	46.4	57.4	67.4	79.4	88.4	sec	T-460
Taber Stiffness, CD, 15 deg	3.1	4.3	5.7	7.2	9.1	12.0	15.3	18.6	23.9	28.7	32.5	36.3	mN.m	T-489
Taber Stiffness, GM, 15 deg	4.8	6.7	9.1	11.1	14.1	18.5	23.7	29.4	37.0	44.0	50.8	56.7	mN.m	T-489
Cobb, Top, 2 min	45	45	45	45	45	45	45	45	45	50	50	50	mN.m	T-489
Cobb, Bottom, 2 min	50	50	50	50	50	50	50	50	50	50	50	50	g/m2	T-441
Scott Internal Bond	210	210	210	210	210	210	210	210	210	210	210	210	g/m2	T-441
Coefficient of Friction (COF)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	J/m2	T-596
Curl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	T-815
GE Brightness	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	KapStone	KapStone
Smoothness, Felt	300	340	350	355	365	370	375	375	380	385	390	390	percent	T-452
Smoothness, Wire	385	420	420	420	420	420	420	420	420	420	420	420	mL/min	T-538
Elmendorf Tear, MD	3.09	3.19	3.63	3.83	4.27	4.95	5.44	5.79	6.08	6.43	6.57	6.72	mL/min	T-538
MD Tensile	70	80	90	95	102	110	115	118	122	125	135	140	N	T-414
CD Tensile	40	42	45	47	50	55	58	60	63	68	74	77	kN/m	T-494
													kN/m	T-494

* designates non-standard grade that is not run during every Kraftpak run and has trim and minimum volume requirements

Description of Kraftpak Quality Assurance Tests

Caliper T 411	Caliper is measured on the machine by the Measurex scanning gauge and in the lab with a micrometer.	Uniform thickness promotes good converting productivity.
Moisture T 412	Moisture content is measured on the machine by the Measurex scanning gauge and in the lab with a hemi plus infrared gauge.	Moisture impacts scoring, cutting and converting.
Porosity T 460	Gurley porosity measures the time in seconds required for 100cc of air to pass through a given area of paper: A low number results from a more porous paperboard, while a high number equates to a low porosity substrate.	Porosity impacts sheet-fed processes as well as ink and coating absorption and coverage quality.
Stiffness T 489	Taber stiffness is a measure of the force required to deflect a sample 15° in both the machine direction (MD) and cross direction (CD). **Geometric mean (GM) stiffness is the square root of machine direction times the cross direction.**	Stiffness (bending resistance) impacts carton strength and functionality. Stiffness is a vital property for ensuring folding carton performance, and often is considered the primary measure of performance potential.
Cobb T 441	Cobb measures the weight of water absorbed into the surface of paperboard (grams per square meter) during a given exposure time (two minutes).	Cobb relates to water resistance of paperboard. Low Cobb values represent good carton durability and performance in wet conditions.
Internal Bond T 833	The TMI Internal Bond tester measures the resistance of separation into multiple layers. A one-inch sample is anchored with tape to a stationary surface and a 90° angle plate that is impacted by a swinging pendulum. Results are reported in thousandths of a foot pound.	Bond affects scoring and converting performance, and general integrity of the carton.
COF T 815	Coefficient of friction measures the angle at which a sample begins to slide against another sample surface as the incline of the surface is increased. The result is reported as the tangent of the angle.	Uniform COF is important for consistent sheet-fed and blank-fed operations.
Curl KapStone Test	Curl is determined by measuring the amount of deflection that occurs when hanging a strip of paperboard at constant temperature and humidity.	Curl impacts runnability and convertibility. Machine direction curl can be controlled during converting. It is vital to control cross direction curl properties at the time of manufacture.
Brightness T 452	GE brightness measures sample brightness at a specified wavelength of light.	Uniform brightness promotes consistent shade and color.
Basis Weight T 410	Basis weight is measured on the machine by the Measurex scanning gauge or in the lab using gravimetric balance.	Uniformity promotes convertibility.
Smoothness T 538	Sheffield smoothness measures the volume of air leakage from a sample place between a gauging head under low pressure and a flat glass plate. Rough samples allow greater leakage and therefore higher number expressed in ml/min.	Smooth surfaces promote printability.
Tear T 414	The L & W Tear Tester measures the grams-force necessary to tear a single ply and is generally used for machine direction (MD) tear.	Tear is primarily a property of the inner structure of a sheet. Virgin, long pine fibers and low density design promote excellent tear strength.
Tensile T 494	The L & W Tensile Tester measures the force per unit width required to break a sample.	Tensile strength governs web strength, which is necessary for runnability and convertibility.

Converting Performance

KapStone Technical Sales Services Representatives

- KapStone Technical Sales Services (TSS) Representatives are available to provide information on all aspects of Kraftpak features and performance optimization. As needed, please feel free to consult your KapStone TSS rep to assist with initial trials or to address any performance problems or questions.

Kraftpak® - Converting Recommendations

Sheeting

- Use double-fly knife if possible, especially on heavier weights. Because of the strong kraft fibers, it is recommended to keep blades sharp.
- Decurling: Because of Kraftpak's high stiffness, on higher calipers (.024 and above), care should be taken when decurling to minimize surface damage (compression creasing or "alligatoring"). Decurl rollers two inches or greater in diameter are recommended.
- Additionally, you may want to discuss with your KapStone TSS Rep how winding direction (smooth-side-in or smooth-side-out) will influence roll-set curl (the original Kraftpak parent reel from the paper machine is oriented smooth-side-in before individual customer rolls are rewound).

Printing Performance - General

- Kraftpak's felt (smooth) side can be printed flexo, rotogravure or offset. For optimum shelf impact, it is recommended to consider graphics which include rich, strong color themes (reds, burgundy, dark greens and blues) that are compatible with and enhance KRAFTPAK's natural brown base. Kraftpak's wire side (back side) is not specifically designed for printing, though some converters successfully print on the back side in two-side applications, or in cases where the 'rugged' look is desired. Keep in mind that Kraftpak's wire side is relatively rough, and that frequent cleanups are to be expected when printing on this surface.
- Pastels are typically the most difficult colors with which to attain intensity, opacity and ink rub control on kraft board, but many printers have used pastel color themes very successfully with Kraftpak.
- Precoats can be beneficial for both increased opacity and improved ink holdout. This strategy may help prevent separation of ink pigment and resins, and may help avoid leaving unbonded pigment on the surface. Clay-based, high solids acrylics are effective for base coat purposes.
- Contact your ink suppliers to determine the best formulations to be applied to the uncoated kraft surface for optimum results.
- Kraftpak surfaces have good water resistance. When coatings are used, typically, high solids, water-based coatings are more effective than true solvent-based varnishes on KRAFTPAK®.
- Top coatings over ink can be effective in minimizing ink rub properties, particularly in full-ink coverage applications. Top coats (commonly water-based acrylics) are often applied using anilox rolls in the 150-200 lines/inch (60-80 lines/cm) range.
- Polywax or silicon additives can be effective for increasing slip properties and improving rub properties of inks and coatings.
- Drying agents are often added to enhance drying rates.
- Reflex inks are sometimes used to improve opacity.
- To achieve best color results on process jobs, magenta and cyan colors may be adjusted from normal targets to compensate for Kraftpak's brown background.
- Dot gain: expect typically 15% gain on a 50% screen.

Flexo Printing

- Anilox rolls should have cell volume adequate for delivering inks and coatings to kraft board. For many prints jobs 200 lines/inch (80 lines/cm) anilox rolls are commonly used.
- Softer flexo plates and cushions may be beneficial for improved surface contact when printing the Kraftpak surface.

Offset Litho Printing

- Compressible blankets are recommended for offset applications. Impression cylinder pressure should be adjusted as appropriate to eliminate mottle. Ink film thickness of about 0.5 mils (12.7 μm) may be necessary for adequate ink application.
- Kraftpak will generally require more impression pressure than other folding carton grades.
- Gap setting of .002" to .004" below nominal is good starting point
- Ink tack levels are generally recommended to be in the 8-12 range (800 rpm) for good results.
- UV curing can provide ability to print white base patterns as needed on a single pass.
- If necessary, textured grippers may help with consistent sheet transfer between print stations.

Die-Cutting and Scoring Considerations

- Kraftpak's uniformity, high strength and low density structure promote excellent performance in embossing and scoring. It should be further noted that Kraftpak's low density makes it more compressible as compared to other folding carton grade substrates such as unbleached coated and uncoated recycled board (CRB, URB). Consequently, cutting and scoring parameters should be chosen to overcome the strong and compressible nature of Kraftpak and to ensure optimum fold performance with reduced post-scoring springback.
- Because of the high strength and "memory" of Kraftpak's softwood fibers, scorelines need to be sufficiently deep to avoid unnecessary spring-back properties. Standard, to slightly higher, impression pressure may be required for adequate scoring of Kraftpak.
- Cutting performance is similar to that of other kraft fiber substrates (CUK), significantly different from that of SBS and recycled grades. Cutting knives should be sharp.
- With Kraftpak's high fiber strength, fewer and smaller nicks are typically needed on perforation lines as compared to recycled or SBS grades.

Recommended initial scoring parameters (grain and cross-grain direction) are below. These guidelines are offered only as useful starting points, given potential differences in age and machine tolerances between commercial die-cutting machines.

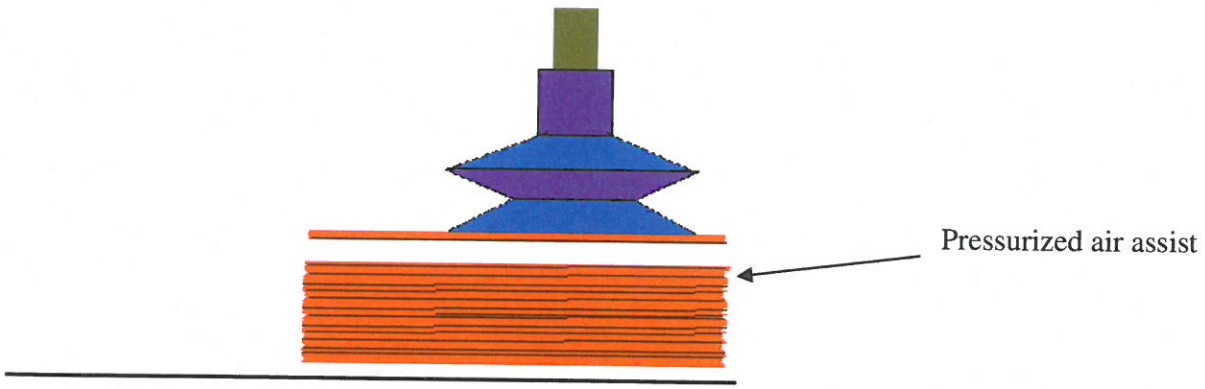
- Rule Width — 2 pt rule for .013 – .018 caliper Kraftpak
  3 pt rule for .020 – .030 caliper Kraftpak
- Channel Width — Twice the board caliper plus the rule width
- Rule Penetration — Target 0.006" penetration beyond the top of the channel
  Understanding that the rule penetration is a function of the knife, rule, and channel heights, each of the three parameters should be chosen to achieve an initial rule penetration target of 0.006".

Gluing Performance

- Cold glue: Standard, packaging grade, cold set PVA adhesives work well. High solids (50% plus), high viscosity (3,500 cps plus) resin-based adhesives are recommended for cold gluing with Kraftpak.
- Cold set adhesives can be applied via glue gun or applicator wheel.
- Because of its tighter pore structure, the top (felt) side of Kraftpak has greater glue hold out properties. (This should be considered when determining which side of the board should have glue applied and may require open time adjustment).
- Hot melt: Conventional hot-melt adhesive work effectively on Kraftpak and polycoated Kraftpak carton applications.
- Kraftpak typically runs very well on high-speed folder-gluers because of its relatively light weight, uniformity and COF control.
- Pre-break stations may be especially useful on cartons where tight folds are critical for the end user.

Vacuum Feeding/Handling Performance

- Kraftpak cartons can perform well on all conventional types of converting and feeding equipment, though due to its unique low density, Kraftpak has a relatively open pore structure with high air permeability or low Gurley porosity, compared to other substrates. This should be considered for vacuum feeding/handling of Kraftpak sheets or carton blanks.
- Vacuum systems should be well maintained with vacuum cups in good condition, and some adjustments may be recommended for optimum operation.
- Pressurized air impingement can be highly beneficial to ensure reliable, single-blank feeding.
- Positioning the cups near the edge of the blank and using edge restraining tabs can benefit reliable feeding performance.
- Bellows-type vacuum cups (soft compound or vinyl) have been found to be particularly effective for vacuum feeding of Kraftpak.
- Specialized, unique bellows cups with leveraged inserts, designed by our technical group, can be provided or recommend by our TSS reps where appropriate, to provide further insurance of reliable performance.
- Speak to your KapStone TSS rep to determine optimum strategy for reliable vacuum feeding.



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