

List of properties for which samples are provided and their indicative ranges

No	Property	CL	Standard	Units	Levels	1	2	3	4	5
1	Basic properties									
1.1	Thickness	Innovhub-SSCCP	EN 20534	µm	4	45.0÷55.0	70.0÷80.0	200÷250	500÷600	
1.2	Thickness corrugated board	CELABOR	ISO 3034	mm	2	3.8÷4.4	6.6÷7.2			
1.3	Grammage	SMITHERS-PIRA	ISO 536	g/m ²	3	45.0÷55.0	85.0÷105	270÷290		
2	Strength properties									
2.1(a)	Tensile strength	Innovhub-SSCCP	ISO 1924-2	kN/m	4	2.50÷3.50	4.50÷5.50	7.00÷8.00	9.50÷11.5	
2.1(b)	Stretch at break	Innovhub-SSCCP	ISO 1924-2	%	4	6.00÷8.00	1.00÷2.00	1.00÷2.00	4.00÷6.00	
2.2	Tensile strength after immersion in water	Innovhub-SSCCP	ISO 3781	N/m	2	500÷700	1500÷2000			
2.3	Tearing resistance (Elmendorf)	SMITHERS-PIRA	EN 21974	mN	4	280÷340	500÷900	1200÷1500	1700÷2000	
2.4	Tear growth (Brecht-Imset)	PTS	DIN 53115	mNm/m	3	450÷550	870÷990	1240÷1400		
2.5	Compressive strength (short span test)	INNVENTIA	ISO 9895	kN/m	4	1.40÷1.90	2.00÷3.00	5.00÷6.00	9.00÷11.0	
2.6	Ring crush test (RCT)	CELABOR	ISO 12192	kN/m	3	0.60÷1.00	1.60÷2.10	3.10÷3.90		
2.7	Flat crush resistance (FCT)	CELABOR	EN 23035	kPa	2	150÷300	300÷450			
2.8	Flat crush resistance after laboratory fluting (CMT)	SMITHERS-PIRA	ISO 7263	N	2	100÷250	300÷500			
2.9(a)	Edgewise crush resistance (ECT) Pre-cut	CELABOR	ISO 3037	kN/m	2	6.0÷8.0	10.0÷15.0			
2.9(b)	Edgewise crush resistance (ECT) Lab cut	CELABOR	ISO 3037	kN/m	2	6.0÷8.0	10.0÷15.0			
2.10	Puncture resistance	SMITHERS-PIRA	ISO 3036	J	2	5.00÷9.00	10.0÷15.0			
2.11	Scott internal bond strength	Innovhub-SSCCP	UNI 9439	J/m ²	3	100÷150	200÷300	500÷700		
2.12	Folding endurance (Schopper)	SMITHERS-PIRA	ISO 5626	log ₁₀ (n D.F.)	2	2.00÷2.50	2.60÷3.40			
2.13	Folding endurance (Kohler-Mölin)	INNVENTIA	ISO 5626	log ₁₀ (n D.F.)	2	2.20÷3.00	3.00÷3.30			
2.14	Bursting strength paper	SMITHERS-PIRA	ISO 2758	kPa	4	100÷160	300÷400	600÷700	750÷900	
2.15	Bursting strength board	SMITHERS-PIRA	ISO 2759	kPa	5		300÷400	600÷700	750÷900	1100÷1700
2.17	Bursting strength corrugated board	CELABOR	ISO 2759	kPa	2	800÷1200	1800÷2400			
2.18a	Tensile strength	INNVENTIA	ISO 1924-3	kN/m	3	2.0÷3.0	6.0÷8.0	14.0÷16.0		
2.18b	Tensile stretch	INNVENTIA	ISO 1924-3	%	3	3.0÷6.0	6.0÷9.0	1.0÷3.5		
2.18c	Tensile energy absorption (TEA)	INNVENTIA	ISO 1924-3	J/m ²	3	50÷90	250÷500	150÷250		
2.18d	Tensile stiffness	INNVENTIA	ISO 1924-3	kN/m	3	150÷350	300÷600	1200÷2000		
3	Stiffness properties									
3.1	Bending stiffness resonance method	SMITHERS-PIRA	ISO 5629	mNm	4	0.30÷0.50	6.00÷8.50	22.0÷30.0	100÷150	
3.2	Bending resistance (7.5° 15°; 50 mm)	PTS	ISO 2493-1, -2	mN	3	40.0÷60.0	300÷400	1200÷1700		
3.3	Bending stiffness static (5°; 50 mm)	PTS	ISO 5628	mNm	3	4.2÷4.6	30÷35	230÷270		
3.4	Bending resistance (15°; 10 mm)	CELABOR	(ISO 2493)	mN	2	28.0÷34.0	46.0÷56.0			
3.5(a)	TSO – Tensile stiffness index MD	INNVENTIA	---	kNm/g	4	7.0÷10.0	8.0÷10.0	10.0÷13.0	10.0÷13.0	
3.5(b)	TSO – Tensile stiffness index CD	INNVENTIA	---	kNm/g	4	1.5÷2.5	2.5÷4.2	4.2÷4.8	6.0÷6.9	
3.5(c)	TSO – Orientation angle	INNVENTIA	---	°	4	-2.0÷3.0	-1.0÷4.0	-1.00÷3.00	1.00÷3.50	
4	Surface properties									
4.1	Smoothness Bekk	PTS	ISO 5627	s	4	35.0÷45.0	120÷160	200÷300	1000÷2000	
4.2	Roughness Bendtsen	PTS	ISO 8791-2	ml/min	3	35.0÷60.0	200÷300	1300÷2300		
4.3	Roughness Parker Print-surf	SMITHERS-PIRA	ISO 8791-4	µm	3	1.0÷2.0	2.5÷3.5	5.0÷7.5		
4.4(a)	Coefficient of friction static	IGT	ISO 15359	---	2	0.25÷0.45	0.45÷0.80			
4.4(b)	Coefficient of friction dynamic	IGT	ISO 15359	---	2	0.20÷0.30	0.30÷0.70			
4.5	Coefficient of friction, inclined plane	IGT	UNI 9802, DIN 53119-2. NF Q 03-083	---	2	0.25÷0.45	0.45÷0.80			
4.6	Contact Angle	CTP	?	°	3	30.0÷50.0	70.0÷90.0	110.0÷130.0		

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5	Structural properties									
5.1	Air permeance Schopper	PTS	ISO 5636-2	ml	3	10.0÷35.0	70.0÷100	150÷200		
5.2	Air permeance Bekk	PTS	---	s	4	5.00÷12.0	10.0÷20.0	20.0÷120	220÷260	
5.3	Air permeance Bendtsen	PTS	ISO 5636-3	ml/min	4	40.0÷60.0	130÷180	430÷500	1400÷2000	
5.4	Air permeance Gurley	PTS	ISO 5636-5	s	3	35.0÷55.0	60.0÷100	400÷650		
6	Optical properties									
6.1(a)	RX, Illuminant C, UV adjusted	CTP	ISO 2469	%	2	68.0÷71.0	87.0÷89.0			
6.1(b)	RY, Illuminant C, UV adjusted	CTP	ISO 2469	%	2	67.0÷71.0	87.0÷89.0			
6.1(c)	RZ, Illuminant C, UV adjusted	CTP	ISO 2469	%	2	62.0÷65.0	89.0÷92.0			
6.2(a)	RX, Illuminant D65, UV adjusted	CTP	ISO 2469	%	2	67.0÷71.0	87.0÷89.0			
6.2(b)	RY, Illuminant D65, UV adjusted	CTP	ISO 2469	%	2	66.0÷71.0	88.0÷90.0			
6.2(c)	RZ, Illuminant D65, UV adjusted	CTP	ISO 2469	%	2	62.0÷65.0	98.0÷100.0			
6.3(a)	ISO Brightness, Illuminant C, UV adjusted	CTP	ISO 2470-1	%	4	64.0÷69.0	80.0÷84.0	83.0÷88.0	95.0÷99.0	
6.3(b)	ISO Brightness, Illuminant C, UV excluded	CTP	ISO 2470-1	%	4	64.0÷69.0	80.0÷84.0	75.0÷79.0	84.0÷88.0	
6.4(a)	ISO Brightness, Illuminant D65, UV adjusted	CTP	ISO 2470-2	%	4	64.0÷69.0	80.0÷84.0	96.0÷99.0	113.0÷116.0	
6.4(b)	ISO Brightness, Illuminant D65, UV excluded	CTP	ISO 2470-2	%	4	64.0÷69.0	80.0÷84.0	79.0÷82.0	86.0÷90.0	
6.5	Opacity, Illuminant C, UV adjusted	CTP	ISO 2471	%	2	31.0÷34.0	85.0÷89.0			
6.6(a)	CIE Whiteness, Illuminant D65, UV adjusted	CTP	ISO 11475	%	2	122.0÷125.0	166.0÷170.0			
6.6(b)	CIE Whiteness, Illuminant D65, UV excluded	CTP	ISO 11475	%	2	83.0÷89.0	92.0÷96.0			
6.7(a)	L*, Illuminant C, UV adjusted	CTP	ISO 5631-1	%	2	85.0÷88.0	82.0÷84.0			
6.7(b)	a*, Illuminant C, UV adjusted	CTP	ISO 5631-1	%	2	-2.0÷-0.0	-2.2÷-1.0			
6.7(c)	b*, Illuminant C, UV adjusted	CTP	ISO 5631-1	%	2	3.0÷6.0	3.0÷5.0			
6.8(a)	L*, Illuminant D65, UV adjusted	CTP	ISO 5631-2	%	2	93.0÷95.0	92.0÷95.0			
6.8(b)	a*, Illuminant D65, UV adjusted	CTP	ISO 5631-2	%	2	1.6÷1.9	3.0÷5.0			
6.8(c)	b*, Illuminant D65, UV adjusted	CTP	ISO 5631-2	%	2	-7.0÷-5.0	-18.5÷-16.0			
6.9(a)	L* col. paper, Illuminant C, UV adjusted	CTP	ISO 5631-1	%	3	41.0÷44.0	68.0÷69.0	68.0÷71.0		
6.9(b)	a* col. paper, Illuminant C, UV adjusted	CTP	ISO 5631-1	%	3	49.0÷51.0	-20.0÷-19.0	-39.0÷-37.0		
6.9(c)	b* col. paper, Illuminant C, UV adjusted	CTP	ISO 5631-1	%	3	19.0÷21.0	-30.0÷-29.0	49.0÷53.0		
6.10(a)	L* col. paper, Illuminant D65, UV adjusted	CTP	ISO 5631-2	%	3	40.0÷43.0	69.0÷71.0	68.0÷71.0		
6.10(b)	a* col. paper, Illuminant D65, UV adjusted	CTP	ISO 5631-2	%	3	46.0÷48.0	-26.0÷-24.0	-31.0÷-29.0		
6.10(c)	b* col. paper, Illuminant D65, UV adjusted	CTP	ISO 5631-2	%	3	17.0÷19.0	-28.0÷-26.0	49.0÷53.0		
6.11	Gloss 75°, converging beam	INNVENTIA	ISO 8254-1	%	2	40.0÷55.0	70.0÷85.0			
6.12(a)	L*, Illuminant D50, 45/0, M0/M1	CTP	ISO 13655	%	4	90.0÷92.0	95.0÷97.0	87.0÷90.0	90.0÷92.0	
6.12(b)	a*, Illuminant D50, 45/0, M0/M1	CTP	ISO 13655	%	4	-0.6÷-0.5	-1.0÷-1.0	0.0÷2.0	1.0÷4.0	
6.12(c)	b*, Illuminant D50, 45/0, M0/M1	CTP	ISO 13655	%	4	10.0÷11.0	3.0÷-4.0	-5.0÷-3.0	-12.5÷-6.0	
7	Chemical properties									
7.1	Kappa number	PTS	ISO 302	---	2	< 5	80÷100			
7.2	pH of aqueous extracts	PTS	ISO 6588	---	2	7.0÷8.0	9.0÷10.0			
7.3	Alkali reserve	PTS	ISO 10716	mol/kg	2	< 1.0	2.0÷3.0			
7.4(a)	Residue (ash) at 525°C	PTS	ISO 1762	%	2	4.00÷7.00	10.0÷13.0			
7.4(b)	Residue (ash) at 900°C	PTS	ISO 2144	%	2	3.00÷5.00	6.00÷8.0			
8	Tissue properties									
8.1(a)	Tissue, Single-sheet thickness	INNVENTIA	ISO 12625-3	mm	2	0.09÷0.11	0.25÷0.35			
8.1(b)	Tissue, Bulking thickness	INNVENTIA	ISO 12625-3	mm	2	0.07÷0.10	0.24÷0.34			
8.2	Tissue, Tensile strength after immersion in water	SMITHERS-PIRA	ISO 12625-5	N/m	2	35.0÷55.0	70.0÷90.0			
8.3(a)	Tissue, Residual water absorption capacity	INNVENTIA	ISO 12625-8	g/g	2	6.0÷9.0	14.0÷16.0			
8.3(b)	Tissue, Residual water absorption time	INNVENTIA	ISO 12625-8	s	2	1.0÷3.0	2.0÷5.0			
8.4	Tissue, ISO Brightness, Illuminant C, UV adjusted	CTP	ISO 12625-15	%	2	74.0÷77.0	85.0÷88.0			
8.5(a)	Tissue, Tensile strength	SMITHERS-PIRA	ISO 12625-4	N/m	2	100÷150	600÷700			
8.5(b)	Tissue, Stretch at break	SMITHERS-PIRA	ISO 12625-4	%	2	16÷20	10÷17			
8.6 EXP	Tissue, TSA Softness	INNVENTIA		HF Number	?					

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9	Printability properties									
9.1	Resistance to picking IGT	IGT	ISO 3783	m/s	---	0.40÷0.90	1.70÷2.20			
9.2	Print penetration IGT	IGT	IGT W24	mm	2	100÷110	120÷140			
9.3	Print Gloss 60°	IGT	ISO 2834	%	2	55÷65	70÷80			
9.4	Print Gloss 75°	IGT	ISO 2834	%	2	65÷75	80÷90			
9.5(a)	L* printed paper, Illuminant D50	CTP	ISO 13655	%	4	15.0±18.0	54.0±57.0	45.0±48.0	85.0±90.0	
9.5(b)	a* printed paper, Illuminant D50	CTP	ISO 13655	%	4	0.2±0.5	-39.0÷-34.0	72.0±75.0	-6.0÷-4.0	
9.5(c)	b* printed paper, Illuminant D50	CTP	ISO 13655	%	4	0.5±1.3	-50.0÷-47.0	-5.0±-3.0	92.0±97.0	
9.6	Optical density printed paper	CTP	ISO 5-4	%	4	1÷2.5 (Black)	1÷2 (Cyan)	1÷2 (Magenta)	1÷2 (Yellow)	
9.7	Linearity of a densitometer	CTP	ISO 5-4	%	4	-0.01±0.03	0.3±0.4	0.5±1.5	1.0±2.5	
9.8	Heliotest	IGT	IGT W41	mm	2	40÷60	80±100			
9.9	Set-off	IGT	IGT W48	D	0	÷	÷			
9.10	Mottle	IGT	IGT W57	---	0	÷	÷			
9.11	Ink transfer	IGT	ISO 2834	g/m ²	2	0.9±1.1	1.4±1.6			
9.12 EXP	Resistance to picking, Dennison Waxes	IGT	TAPPI T-459 ??	number	4	
10	Miscellaneous									
10.1(a)	Water absorption Cobb 60s (paper)	CELABOR	ISO 535	g/m ²	2	15.0±20.0	25.0±30.0			
10.1(b)	Water absorption Cobb 600s (board)	CELABOR	ISO 535	g/m ²	1	90±140				
10.1(c)	Water absorption Cobb 1800s (corrugated board)	CELABOR	ISO 535	g/m ²	1	100±130				
10.2(a)	Drainability (Schopper-Riegler)	Innovhub-SSCCP	ISO 5267-1	SR	3	15±25	30±50	50±70		
10.2(b)	Drainability ("Canadian Standard" freeness)	Innovhub-SSCCP	ISO 5267-2	ml	3	100±250	250±400	400±600		
10.3	Relative humidity	SMITHERS-PIRA	EN 20187	%	1	---				
10.4(a)	Fibre length	INNVENTIA	ISO 16065	mm	2	0.7±1.0	2.0±2.5			
10.4(b)	Fibre width	INNVENTIA	ISO 16065	µm	2	12±25	15±35			
10.5(a)	Peel adhesion (180°) at 300mm per minute (20min)	PTS	FINAT 1, 20min	N/25 mm	2	0.3±0.8	7.0±10.0			
10.5(b)	Peel adhesion (180°) at 300mm per minute (24h)	PTS	FINAT 1, 24h	N/25 mm	2	0.5±1.7	8.0±11.0			
10.6	Low speed release force	PTS	FINAT 3	cN/50 mm	2	8.0±10.0	15.0±19.0			
10.7	'Loop' tack measurement	PTS	FINAT 9	N	2	3.0±4.0	10.0±14.0			