

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

Approved by the Cepi-CTS WG in Apeldoorn on April 23 2004
 Updated Rev.35: January 2022 (Special samples size added)
 Updated Rev.36: March 2022 (Z-directional tensile strength added, Smithers indicative ranges)
 Updated Rev.37: July 2022 PTS indicative ranges)
 Updated Rev.38: January 2023 (discontinued tests, Grammage Level 4, Innovhub+PTS ranges)

Updated Rev.40: February 2024 (ECT, Moisture)

| No | Property | CL | Standard | Units | Levels | 1 | 2 | 3 | 4 | 5 |
|----------|--|----------|---------------------------------|----------------------------|--------|-----------|-----------|-----------|-----------|-----------|
| 1 | Basic properties | | | | | | | | | |
| 1.1 | Thickness | INNOVHUB | ISO 534 | µm | 4 | 45.0÷60.0 | 65.0÷80.0 | 190÷220 | 500÷600 | |
| 1.2 | Thickness of corrugated board | CELABOR | ISO 3034 | mm | 2 | 3.8÷4.4 | 6.6÷7.2 | | | |
| 1.3 | Grammage | SMITHERS | ISO 536 | g/m ² | 3 | 55.0÷65.0 | 85.0÷105 | 270÷290 | 500÷700 | |
| 1.4 | Moisture content | PTS | ISO 287 | % | 2 | 4.6÷5.4 | 6,3÷7,3 | | | |
| 2 | Strength properties | | | | | | | | | |
| 2.1(a) | Tensile strength | INNOVHUB | ISO 1924-2 | kN/m | 4 | 1.50÷2.50 | 4.50÷5.50 | 6.50÷7.50 | 9.50÷11.5 | |
| 2.1(b) | Strain at break | INNOVHUB | ISO 1924-2 | % | 4 | 5.00÷7.00 | 1.00÷2.00 | 1.50÷2.50 | 4.00÷6.00 | |
| 2.2 | Tensile strength after immersion in water | INNOVHUB | ISO 3781 | N/m | 2 | 400÷700 | 1500÷2000 | | | |
| 2.3 | Tearing resistance (Elmendorf) | SMITHERS | ISO 1974 | mN | 4 | 280÷340 | 500÷900 | 1500÷2000 | 2000÷2500 | |
| 2.4 | Tear growth (Brecht-Imset) | PTS | DIN 53115 | mNm/m | 3 | 400÷500 | 800÷1000 | 1240÷1440 | | |
| 2.5 | Compressive strength (short span test) | PTS | ISO 9895 | kN/m | 4 | 1.30÷1.80 | 2.50÷3.50 | 5.0÷6.0 | 8.00÷9.00 | |
| 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 | ISO 3035 | kPa | 2 | 150÷300 | 300÷450 | | | |
| 2.8 | Flat crush resistance after laboratory fluting (CMT) | SMITHERS | ISO 7263-1 | N | 2 | 100÷250 | 300÷500 | | | |
| 2.9(a) | Edgewise crush resistance (ECT) Pre-cut | CELABOR | ISO 3037 | kN/m | 2 | 7.5÷11.5 | 12.0÷17.0 | | | |
| 2.9(b) | Edgewise crush resistance (ECT) Lab cut | CELABOR | ISO 3037 | kN/m | 2 | 7.5÷11.5 | 12.0÷17.0 | | | |
| 2.10 | Puncture resistance | SMITHERS | ISO 3036 | J | 2 | 3.00÷7.00 | 10.0÷15.0 | | | |
| 2.11 | Scott internal bond strength | INNOVHUB | TAPPI T-569 | J/m ² | 3 | 100÷150 | 200÷350 | 500÷800 | | |
| 2.12 | Folding endurance (Schopper) | SMITHERS | ISO 5626 | log ₁₀ (n D.F.) | 2 | 2.00÷2.50 | 2.60÷3.40 | | | |
| 2.13 | Folding endurance (Köhler-Molin) | SMITHERS | ISO 5626 | log ₁₀ (n D.F.) | 2 | 2.20÷3.00 | 3.00÷3.30 | | | |
| 2.14 | Bursting strength paper | SMITHERS | ISO 2758 | kPa | 4 | 130÷170 | 300÷400 | 600÷700 | 750÷900 | |
| 2.15 | Bursting strength board | SMITHERS | ISO 2759 | kPa | 5 | 130÷170 | 300÷400 | 600÷700 | 750÷900 | 1100÷1700 |
| 2.17 | Bursting strength corrugated board | CELABOR | ISO 2759 | kPa | 2 | 800÷1200 | 1800÷2400 | | | |
| 2.18(a) | Tensile strength | SMITHERS | ISO 1924-3 | kN/m | 3 | 2.0÷3.0 | 6.0÷8.0 | 14.0÷16.0 | | |
| 2.18(b) | Tensile strain | SMITHERS | ISO 1924-3 | % | 3 | 3.0÷6.0 | 1.0÷2.5 | 1.0÷3.5 | | |
| 2.18(c) | Tensile energy absorption (TEA) | SMITHERS | ISO 1924-3 | J/m ² | 3 | 50÷90 | 90÷200 | 150÷250 | | |
| 2.18(d) | Tensile stiffness | SMITHERS | ISO 1924-3 | kN/m | 3 | 150÷350 | 700÷1200 | 1200÷2000 | | |
| 3 | Stiffness properties | | | | | | | | | |
| 3.1 | Bending stiffness resonance method | SMITHERS | ISO 5629 | mNm | 4 | 0.30÷0.75 | 6.00÷8.50 | 22.0÷30.0 | 50÷100 | |
| 3.2 | Bending resistance (7.5° 15°; 50 mm) CRD | PTS | ISO 2493-1 | mN | 3 | 55.0÷75.0 | 300÷400 | 1200÷1700 | | |
| 3.3 | Bending stiffness static (5°; 50 mm) | PTS | ISO 5628 | mNm | 3 | 5.5÷7.5 | 30÷40 | 200÷300 | | |
| 3.4 | Bending resistance (15°; 10 mm) | CELABOR | ISO 2493-1 | mN | 2 | 28.0÷34.0 | 46.0÷56.0 | | | |
| 3.5(a) | TSO – Tensile stiffness index MD | PTS | --- | kNm/g | 4 | 8.0÷12.0 | 9.0÷13.0 | 9.0÷13.0 | 8.0÷11.0 | |
| 3.5(b) | TSO – Tensile stiffness index CD | PTS | --- | kNm/g | 4 | 2.0÷4.0 | 6,0÷8,0 | 4.0÷6.0 | 3.8÷5.4 | |
| 3.5(c) | TSO – Orientation angle | PTS | --- | ° | 4 | -3.0÷3.0 | -5,0÷5,0 | -4.0÷4.0 | -3,0÷3,0 | |
| 3.6 | Bending resistance (7.5° 15°; 50 mm) Taber | PTS | ISO 2493-2 | mNm | 3 | 2.5÷3.5 | 15.0÷17.0 | 65,0÷75,0 | | |
| 4 | Surface properties | | | | | | | | | |
| 4.1 | Smoothness Bekk | PTS | ISO 5627 | s | 4 | 25,0÷40,0 | 140÷180 | 200÷300 | 1300÷2000 | |
| 4.2 | Roughness Bendtsen | PTS | ISO 8791-2 | ml/min | 3 | 40,0÷70,0 | 150÷250 | 650÷850 | 1200÷1700 | |
| 4.3 | Roughness Parker Print-surf | SMITHERS | ISO 8791-4 | µm | 3 | 1,0÷2,0 | 2,5÷3,5 | 5,0÷7,5 | | |
| 4.4(a) | Coefficient of friction static | PTS | ISO 15359 | --- | 2 | 0,30÷0,50 | 0,45÷0,80 | | | |
| 4.4(b) | Coefficient of friction dynamic | PTS | ISO 15359 | --- | 2 | 0,25÷0,35 | 0,30÷0,40 | | | |
| 4.5 | Coefficient of friction, inclined plane | PTS | UNI 9802, DIN 53119-2. NF Q 03- | --- | 2 | 0,30÷0,50 | 0,45÷0,80 | | | |
| 4.6 (a) | Contact Angle 0,1s | PTS | ISO 14778 | ° | 3 | 55÷75 | 70÷90 | 100÷125 | | |
| 4.6 (b) | Contact Angle 1s | PTS | ISO 14778 | ° | 3 | 55÷75 | 65÷85 | 100÷125 | | |
| 4.6 (c) | Contact Angle 10s | PTS | ISO 14778 | ° | 3 | 55÷75 | 55÷75 | 100÷125 | | |
| 5 | Structural properties | | | | | | | | | |
| 5.2 | Air permeance Bekk | PTS | --- | s | 4 | 4,00÷10,0 | 10,0÷15,0 | 40,0÷90,0 | 170÷230 | |
| 5.3 | Air permeance Bendtsen | PTS | ISO 5636-3 | ml/min | 4 | 5,0÷35,0 | 110÷160 | 450÷550 | 1500÷2500 | |
| 5.4 | Air permeance Gurley | PTS | ISO 5636-5 | s | 3 | 35,0÷55,0 | 60,0÷100 | 400÷650 | | |

| No | Property | CL | Standard | Units | Levels | 1 | 2 | 3 | 4 | 5 |
|-----------|---|----------|----------------|------------------|--------|-------------|-------------|-------------|-------------|---|
| 6 | Optical properties | | | | | | | | | |
| 6.1(a) | RX, Illuminant C, UV adjusted | CTP | ISO 2469 | % | 2 | 68.0÷72.0 | 81,5÷82,5 | | | |
| 6.1(b) | RY, Illuminant C, UV adjusted | CTP | ISO 2469 | % | 2 | 67.0÷71.0 | 82,5÷84,5 | | | |
| 6.1(c) | RZ, Illuminant C, UV adjusted | CTP | ISO 2469 | % | 2 | 62.0÷65.0 | 99,0÷101.0 | | | |
| 6.2(a) | RX, Illuminant D65, UV adjusted | CTP | ISO 2469 | % | 2 | 67.0÷72.0 | 88.0÷91.0 | | | |
| 6.2(b) | RY, Illuminant D65, UV adjusted | CTP | ISO 2469 | % | 2 | 66.0÷71.0 | 89.0÷91.0 | | | |
| 6.2(c) | RZ, Illuminant D65, UV adjusted | CTP | ISO 2469 | % | 2 | 62.0÷65.0 | 99.0÷102.0 | | | |
| 6.3(a) | ISO Brightness, Illuminant C, UV adjusted | CTP | ISO 2470-1 | % | 4 | 65.0÷69.0 | 85.0÷88.0 | 72.0÷75.0 | 95.0÷99.0 | |
| 6.3(b) | ISO Brightness, Illuminant C, UV excluded | CTP | ISO 2470-1 | % | 4 | 65.0÷69.0 | 85.0÷88.0 | 68.0÷72.0 | 84.0÷88.0 | |
| 6.4(a) | ISO Brightness, Illuminant D65, UV adjusted | CTP | ISO 2470-2 | % | 4 | 64.0÷69.0 | 85.0÷88.0 | 96.0÷99.0 | 111.0÷114.0 | |
| 6.4(b) | ISO Brightness, Illuminant D65, UV excluded | CTP | ISO 2470-2 | % | 4 | 64.0÷69.0 | 85.0÷88.0 | 79.0÷82.0 | 86.0÷90.0 | |
| 6.5 | Opacity, Illuminant C, UV adjusted | CTP | ISO 2471 | % | 2 | 49.0÷53.0 | 85.0÷89.0 | | | |
| 6.6(a) | CIE Whiteness, Illuminant D65, UV adjusted | CTP | ISO 11475 | % | 2 | 129.0÷133.0 | 164.0÷169.0 | | | |
| 6.6(b) | CIE Whiteness, Illuminant D65, UV excluded | CTP | ISO 11475 | % | 2 | 74.0÷77.0 | 92.0÷98.0 | | | |
| 6.7(a) | L*, Illuminant C, UV adjusted | CTP | ISO 5631-1 | % | 2 | 85.0÷88.0 | 83.0÷86.0 | | | |
| 6.7(b) | a*, Illuminant C, UV adjusted | CTP | ISO 5631-1 | % | 2 | -2.0÷1.0 | -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 | 88.0÷90.0 | 93.0÷96.0 | | | |
| 6.8(b) | a*, Illuminant D65, UV adjusted | CTP | ISO 5631-2 | % | 2 | 0,1÷0,4 | 3.0÷5.0 | | | |
| 6.8(c) | b*, Illuminant D65, UV adjusted | CTP | ISO 5631-2 | % | 2 | -5.0÷-2.0 | -18.5÷-16.0 | | | |
| 6.9(a) | L* col. paper, Illuminant C, UV adjusted | CTP | ISO 5631-1 | % | 3 | 41.0÷44.0 | 66.0÷70.0 | 70.0÷71.0 | | |
| 6.9(b) | a* col. paper, Illuminant C, UV adjusted | CTP | ISO 5631-1 | % | 3 | 48.0÷50.0 | -18.0÷-21.0 | -39.0÷-36.0 | | |
| 6.9(c) | b* col. paper, Illuminant C, UV adjusted | CTP | ISO 5631-1 | % | 3 | 18.0÷20.0 | -30.5÷-28,5 | 48.0÷51.0 | | |
| 6.10(a) | L* col. paper, Illuminant D65, UV adjusted | CTP | ISO 5631-2 | % | 3 | 41.0÷43.0 | 68.0÷72.0 | 68.0÷71.0 | | |
| 6.10(b) | a* col. paper, Illuminant D65, UV adjusted | CTP | ISO 5631-2 | % | 3 | 46.0÷48.0 | -28.0÷-24.0 | -30.0÷-28.0 | | |
| 6.10(c) | b* col. paper, Illuminant D65, UV adjusted | CTP | ISO 5631-2 | % | 3 | 16.0÷18.0 | -27.0÷-24.0 | 47.0÷52.0 | | |
| 6.11 | Gloss 75°, converging beam | CELABOR | ISO 8254-1 | % | 2 | 20.0÷40.0 | 70.0÷85.0 | | | |
| 7 | Chemical properties | | | | | | | | | |
| 7.1 | Kappa number | PTS | ISO 302 | --- | 2 | < 5 | 60÷90 | | | |
| 7.2 | pH of aqueous extracts (cold extraction) | PTS | ISO 6588-1 | --- | 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 | Residue (ash) at 525°C | PTS | ISO 1762 | % | 2 | 1,0÷1,6 | 10,5÷11,5 | | | |
| 7.5 | Residue (ash) at 900°C | PTS | ISO 2144 | % | 2 | 0,8÷1,4 | 6,0÷7,0 | | | |
| 8 | Tissue properties | | | | | | | | | |
| 8.1(a) | Tissue, Single-sheet thickness | CTP | ISO 12625-3 | mm | 2 | 0.1÷0.25 | 0.40÷0.60 | | | |
| 8.1(b) | Tissue, Bulking thickness | CTP | ISO 12625-3 | mm | 2 | 0.15÷0.25 | 0.50÷0.70 | | | |
| 8.2 | Tissue, Tensile strength after immersion in water | SMITHERS | ISO 12625-5 | N/m | 2 | 35.0÷55.0 | 70.0÷90.0 | | | |
| 8.3(a) | Tissue, Residual water absorption capacity | CTP | ISO 12625-8 | g/g | 2 | 6.0÷9.0 | 13.0÷15.0 | | | |
| 8.3(b) | Tissue, Residual water absorption time | CTP | ISO 12625-8 | s | 2 | 2.0÷4.0 | 3.0÷6.0 | | | |
| 8.4 | Tissue, ISO Brightness, Illuminant C, UV adjusted | CTP | ISO 12625-15 | % | 2 | 70.0÷75.0 | 81.0÷84.0 | | | |
| 8.5 (a) | Tissue, Tensile strength | SMITHERS | ISO 12625-4 | N/m | 2 | 100÷150 | 600÷700 | | | |
| 8.5 (b) | Tissue, Strech at break | SMITHERS | ISO 12625-4 | % | 2 | 16÷20 | 14÷17 | | | |
| 8.6 (a) | Tissue, TSA Softness | CTP | --- | HF Number | 2 | 60÷70 | 70÷80 | | | |
| 8.6 (b) | Tissue, TSA Softness | CTP | | TS7 | 2 | 18÷28 | 10÷20 | | | |
| 8.6 (c) | Tissue, TSA Softness | CTP | | TS750 | 2 | 20÷40 | 35÷50 | | | |
| 8.6 (d) | Tissue, TSA Softness | CTP | | D | 2 | 1.4÷1.7 | 2.20÷2.5 | | | |
| 8.7 | Tissue, Grammage | SMITHERS | ISO 12625-6 | g/m ² | 2 | 20÷40 | 40÷70 | | | |
| 9 | Printability properties | | | | | | | | | |
| 9.1 | Resistance to picking IGT | PTS | ISO 3783 | m/s | --- | 0.30÷0.80 | 0.80÷2.50 | | | |
| 9.2 | Print penetration IGT | PTS | IGT W24 | mm | 2 | 70÷80 | 130÷140 | | | |
| 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 | |
| 9.12 | Resistance to picking, Dennison Waxes | PTS | TAPPI T-459 | number | 3 | 5÷8 | 7÷11 | 14÷18 | | |
| 10 | Miscellaneous | | | | | | | | | |
| 10.1(a) | Water absorption Cobb 60s (paper) | CELABOR | ISO 535 | q/m ² | 2 | 15.0÷20.0 | 25.0÷30.0 | | | |
| 10.1(b) | Water absorption Cobb 600s (board) | CELABOR | ISO 535 | q/m ² | 1 | 115÷125 | | | | |
| 10.1(c) | Water absorption Cobb 1800s (corrugated board) | CELABOR | ISO 535 | q/m ² | 1 | 100÷130 | | | | |
| 10.2 | Drainability (Schopper-Riegler) | INNOVHUB | ISO 5267-1 | SR | 3 | 15÷25 | 30÷50 | 50÷70 | | |
| 10.3 | Relative humidity | SMITHERS | EN 20187 | % | 1 | --- | | | | |
| 10.4(a) | Fibre length | INNOVHUB | ISO 16065-2 | mm | 2 | 0.7÷1.0 | 2.0÷2.5 | | | |
| 10.4(b) | Fibre width | INNOVHUB | ISO 16065-2 | µm | 2 | 15÷25 | 20÷30 | | | |
| 10.5(a) | Peel adhesion (180°) at 300mm per minute (20min) | PTS | FINAT 1, 20min | N/25 mm | 2 | 1.0÷4.0 | 9.0÷12.0 | | | |

| No | Property | CL | Standard | Units | Levels | 1 | 2 | 3 | 4 | 5 |
|---------|--|----------|--------------|----------|--------|----------|-----------|---------|---|---|
| 10.5(b) | Peel adhesion (180°) at 300mm per minute (24h) | PTS | FINAT 1, 24h | N/25 mm | 2 | 2.0÷5.0 | 10.0÷13.0 | | | |
| 10.6 | Low speed release force | PTS | FINAT 3 | cN/50 mm | 2 | 2,0÷10,0 | 16.0÷26.0 | | | |
| 10.7 | 'Loop' tack measurement | PTS | FINAT 9 | N | 2 | 6,0÷9,0 | 10,0÷20,0 | | | |
| 10.8 | Drainability ("Canadian Standard" Freeness) | INNOVHUB | ISO 5267-2 | ml | 3 | 100÷200 | 200÷300 | 400÷600 | | |

| Special samples size |
|----------------------|
| NO |
| NO |
| NO |
| NO |