Product specification

For capacitor tissue paper, electrolytic paper,
cable paper and insulating paper

The paper factory SPO was established in June 1828. Our industrial production started with the manufacture of glassine. Out of this thin supercalandered paper the capacitor tissue paper was the result of consequent research and development since 1920. Nowadays our product range of high-density electrotechnical papers is complemented through thin cable papers, insulating papers and kraft electrolytic papers.

Our aim is to produce the best electrical grade paper on the world market. Therefore it is absolutely necessary to guarantee essential electrical, chemical and mechanical quality parameters. Production equipment and manufacture are challenged to their utmost limits.

One of the essential criterions is the quality of pulp that is used. For this reason we use exclusively absolute pure 100% electrical grade special kraft pulps.

The use of pure well water, which is further treated by deionization, ensures an exceptionally pure product in order to meet the highest quality demands of our customers.

The production of electrical grade paper is made possible by two high quality and state-of-the-art paper machines.

Consequently, the characteristics and parameters of our jumbo rolls and slited rolls are uniform and perfect.

Product Overview

Grade	Thickness µm	Density g/cm³ (air dry)	further information on page
Capacitor Tissue Paper calandered			
COPA CC	8;10;12; 14; 16; 18; 20; 22; 24; 25; 30	1,00	3
COPA BC	8; 10; 12; 14; 16	1,10	3
COPA AC	8; 9; 10; 12; 13; 15; 16; 20; 25; 30	1,20	4
COPA GC	8; 9; 10; 11; 12; 13; 15	1,30	4
COPA DUO-M	8; 9;	1,17	5
COPA DUO-MH	9	1,27	5
Electrolytic Capacitor Paper – Simplex (Kraft fibre composition)			
COPA ESH	15; 18; 20; 25; 30; 35	0,90	6
COPA ESHS	20	0,95	6
COPA ES	12; 15; 18; 20; 25; 30; 35	0,80	6
COPA ESL	18; 20; 25; 30; 40; 50	0,70	6
COPA ESVL	25; 30; 40; 50; 75	0,65	6
COPA EL	25; 30; 50; 60; 75	0,55	7
COPA EVL	30; 50; 60; 75	0,50	7
Electrolytic Capacitor Paper – Duplex (Kraft fibre composition)			
COPA EDL	35; 40; 45; 50; 60; 65; 70; 90; 110	0,59 up to 0,66	8
COPA EDH	25; 30; 35; 40; 45; 50; 60; 70; 80	0,79	8
COPA EDL M	45; 50; 60		9
COPA EDH M	25; 30; 40; 50; 60; 70	0,80	9
COPA EDS H	30	0,90	9
Electrolytic Capacitor Paper Glatfelter – Simplex (Manila and Manila Mix fibre composition)			
FLM	30; 40; 50; 60; 75; 90	0,30; 0,36; 0,45	10
PUMA	40; 50; 60	0,45; 0,50; 0,54	10
MAE	40; 50	0,54	11
MAP	50	0,45	11
SMF	40; 50	0,54; 0,64	12
Special Cable paper for HV Cable with low loss factor			
COPA CAB	20; 25; 30; 40; 50; 55	0,70	13
Insulating Kraft Paper			
COPA ISO m.finished	30; 60; 63; 75	0,70	14
COPA ISO calandered	30; 40; 50 µm 25 µm - 70 µm upon inquiry 38 µm	0,95 1,00 1,20	14 14 14

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Capacitor tissue paper

Pulp mixture		100 % kraft pulp	
Tolerance thickness		± 6 %	
Tolerance density		± 0,05 g/cm³	
pH-Value		5,5 ... 7,5	
Conductivity		≤ 10 µS/cm	
Ash content		≤ 0,30 %	

COPA CC

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Breakdown voltage	Conducting particles
	µm	*g/cm³*	*g/cm³*	*N/15mm* ≥	*V/µm* ≥	*n/m²* ≤
COPA	8	1,00	0,95	9	65	15
CC	15	1,00	0,95	17	60	10

COPA BC

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Breakdown voltage	Conducting particles
	µm	*g/cm³*	*g/cm³*	*N/15mm* ≥	*V/µm* ≥	*n/m²* ≤
	8	1,10	1,05	12	65	35
	10	1,10	1,05	15	70	25
COPA	12	1,10	1,05	19	75	15
BC	14	1,10	1,05	23	75	15
	16	1,10	1,05	27	75	10

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COPA AC

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Breakdown voltage	Conducting particles
	µm	g/cm³	g/cm³	N/15mm ≥	V/µm ≥	n/m² ≤
	8	1,20	1,14	12	80	40
	9	1,20	1,14	14	90	35
	10	1,20	1,14	16	90	30
COPA	12	1,20	1,14	19	90	20
AC	13	1,20	1,14	21	80	15
	15	1,20	1,14	24	80	15
	16	1,20	1,14	26	80	15
	20	1,20	1,14	31	75	5
	25	1,20	1,14	39	70	5
	30	1,20	1,14	45	65	5

- availability of COPA AC with thickness < 8 µm has to be checked upon inquiry.

COPA GC

Pulp mixture	100 % kraft pulp
Tolerance thickness	± 6 %
Tolerance density	± 0,06 g/cm³
pH-Value	5,5 - 7,5
Conductivity	≤ 10 µS/cm
Ash content	≤ 0,30 %

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Breakdown voltage	Conducting particles
	µm	*g/cm³*	*g/cm³*	*N/15mm* ≥	*V/µm* ≥	*n/m²* ≤
	8	1,30	1,22	13	100	50
	9	1,30	1,22	15	100	45
COPA	10	1,30	1,22	17	100	40
GC	11	1,30	1,22	19	100	40
	12	1,30	1,22	21	100	25
	13	1,30	1,22	23	100	20
	15	1,30	1,22	27	100	20

COPA DUO - M

Capacitor paper for two-side metallizing

Pulp mixture		100 % kraft pulp	
Tolerance thickness		± 6 %	
Tolerance density		± 0,05 g/cm³	
pH-Value		5,5 ... 7,5	
Conductivity		≤ 12 µS/cm	
Ash content		≤ 0,30 %	

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Gloss value
	µm	*g/cm³*	*g/cm³*	*N/15mm* ≥	*scale mark*
COPA	8	1,17	1,10	11	
DUO-M	9	1,17	1,10	13	20 / 27

COPA DUO – MH

Capacitor paper for two-side metallizing

Pulp mixture		100 % kraft pulp	
Tolerance thickness		± 6 %	
Tolerance density		± 0,05 g/cm³	
pH-Value		5,5 ... 7,5	
Conductivity		≤ 20 µS/cm	
Ash content		≤ 0,30 %	

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Air resistance gurley
	µm	*g/cm³*	*g/cm³*	*N/15mm* ≥	*s /100 cm³* ≥
COPA	9	1,27	1,20	15	30.000
DUO-MH					

Electrolytic capacitor paper

COPA ELKO

Pulp mixture	100 % kraft pulp
Tolerance thickness	± 7 %
Tolerance density	± 0,03 g/cm³
Chloride content	≤ 2 ppm
pH-Value	5,5 ... 7,5
Conductivity	≤ 10 µS/cm
Ash content	≤ 0,30 %
Iron particles (No/2000 cm²)	0 (> 0,10 mm²)
Iron particles (No/2000 cm²)	≤ 5 (0,08 – 0,10 mm²)

Grade	Thickness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	Breakdown voltage
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m^2/kg*	*N/15 mm ≥*	*V/µm ≥*
	15	0,90	0,85	13,5	74,1	14	50
COPA	18	0,90	0,85	16,2	61,7	20	50
ELKO	20	0,90	0,85	18,0	55,6	25	50
ESH	25	0,90	0,85	22,5	44,4	30	50
	30	0,90	0,85	27,0	37,0	39	50
	35	0,90	0,85	31,5	31,7	45	50
COPA							
ELKO	20	0,95	0,90	19,0	52,6	25	55
ESHS							
	12	0,80	0,75	9,6	104,2	6	35
	15	0,80	0,75	12,0	83,3	9	35
COPA	18	0,80	0,75	14,4	69,4	13	35
ELKO	20	0,80	0,75	16,0	62,5	19	35
ES	25	0,80	0,75	20,0	50,0	29	35
	30	0,80	0,75	24,0	41,7	33	35
	35	0,80	0,75	28,0	35,7	35	35
							md Water absorption
							mm/10min
	18	0,70	0,66	12,6	79,4	12	0≤
COPA	20	0,70	0,66	14,0	71,4	14	0≤
ELKO	25	0,70	0,66	17,5	57,1	18	0≤
ESL	30	0,70	0,66	21,0	47,6	23	0≤
	40	0,70	0,66	28,0	35,7	30	0≤
	50	0,70	0,66	35,0	28,6	35	0≤
	25	0,65	0,61	16,3	61,5	18	2≤
COPA	30	0,65	0,61	19,5	51,3	23	2≤
ELKO	40	0,65	0,61	26,0	38,5	30	2≤
ESVL	50	0,65	0,61	32,5	30,8	35	2≤
	75	0,65	0,61	48,8	20,5	40	2≤

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COPA ELKO

Pulp mixture	100 % kraft pulp
Tolerance thickness	± 7 %
Tolerance density	± 0,03 g/cm³
Chloride content	≤ 2 ppm
pH-Value	5,5 ... 7,5
Conductivity	≤ 10 µS/cm
Ash content	≤ 0,30 %

Type	Thickness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	md Water absorption
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/15 mm ≥*	*mm/10min ≥*
	25	0,55	0,52	13,8	72,7	14	2
	30	0,55	0,52	16,5	60,6	17	7
ELKO	50	0,55	0,52	27,5	36,4	23	20
EL	60	0,55	0,52	33,0	30,3	24	25
	75	0,55	0,52	41,3	24,2	29	30
	30	0,50	0,47	15,0	66,6	10	4
ELKO	50	0,50	0,47	25,0	40,0	11	25
EVL	60	0,50	0,47	30,0	33,3	13	30
	75	0,50	0,47	37,5	26,7	23	40

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COPA ELKO DUPLEX

Pulp mixture	100% kraft pulp
Tolerance thickness	±7 %
pH-Value	5,5 ... 7,5
Conductivity	≤ 15 µS/cm
Chloride content	≤ 5 ppm

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/15 mm* ≥	*V/µm* ≥	*mm/10min* ≥
	35	0,66	0,62	23,0	43,5	30,0	30	40
	40	0,64	0,60	25,8	38,8	35,0	20	45
COPA	45	0,63	0,60	28,5	35,1	40,0	20	45
ELKO	50	0,65	0,61	32,5	30,8	45,0	20	60
DUPLEX	60	0,63	0,60	38,0	26,3	50,0	20	60
EDL	65	0,63	0,60	41,0	24,4	50,0	15	50
	70	0,62	0,59	43,5	23,0	50,0	15	50
	90	0,59	0,56	53,3	18,8	55,0	10	50
	110	0,60	0,57	65,5	15,3	55,0	10	50

For duplex papers the density and basis weight are calculated mean values of the laminate.

DUPLEX EDL grades are based on ELKO ES as the high density component and on ELKO EL-type papers as the low density component.

COPA ELKO DUPLEX

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption (*)	
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/15 mm*	*V/µm*	*mm/10min*	
						≥	≥	≥	*typical*
	25			19,8	50,6	30		2	
	30			23,7	42,2	30		5	15
COPA	35			27,8	36,2	30		5	15
ELKO	40			31,6	31,6	35		5	20
DUPLEX	45	0,79	0,75	35,6	28,1	40	30	5	20
EDH	50			39,5	25,3	45		5	20
	60			47,4	21,1	50		5	25
	70			55,3	18,1	60		7	25
	80			63,2	15,8	60		7	30

For duplex papers the density and basis weight are calculated mean values of the laminate.

DUPLEX EDH grades are based on ELKO ESH as the high density component and on ELKO ESL-type papers as the low density component.

→ (*) See general information about absorption properties on next page.

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COPA ELKO DUPLEX

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption (*)	
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/ 15 mm*	*V/µm*	*mm/10min*	
						≥	≥	≥	*typical*
COPA	45	0,70	0,66	31,5	31,7	40	20	5	30
ELKO	50	0,70	0,66	35,0	28,6	45	20	5	20
DUPLEX	60	0,70	0,66	42,0	23,8	50	20	5	20
EDLM									

For duplex papers the density and basis weight are calculated mean values of the laminate.

DUPLEX EDLM grades are based on ESL-type papers as the low density component .

→ (*) See below general information about absorption properties.

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption (*)	
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/ 15 mm*	*V/µm*	*mm/10min*	
						≥	≥	≥	*typical*
	25	0,80	0,76	20,0	50,0	30	50	2	5
COPA	30	0,80	0,76	24,0	41,7	40	50	5	15
ELKO	40	0,80	0,76	32,0	31,3	50	50	5	15
DUPLEX	50	0,80	0,76	40,0	25,0	60	50	5	20
EDHM	60	0,80	0,76	48,0	20,8	70	35	5	20
	70	0,80	0,76	56,0	17,9	80	35	5	15

For duplex papers the density and basis weight are calculated mean values of the laminate.

DUPLEX EDHM grades are based on ELKO ES paper grades.

→ (*) See below general information about absorption properties.

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption (*)	
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/ 15 mm*	*V/µm*	*mm/10min*	
						≥	≥	≥	*typical*
COPA	30	0,90	0,85	27,0	37,0	40	70	5	15
ELKO									
DUPLEX									
EDSH									

For duplex papers the density and basis weight are calculated mean values of the laminate.

DUPLEX EDSH grades are based on ELKO ESH paper grades.

General information on absorption properties of duplex papers:
SPO duplex paper grades exhibit partially very pronounced water absorption values as a special consequence of their unique manufacturing process by lamination which can be attributed to a 'capillary rise effect' of a minute lamination gap. This is especially evident in case of the high-density duplex grades in comparison to the base paper components. Typical absorption values of duplex paper can range manifold higher than the lower limit.
For further information please address SPO technical service.

→ Further duplex grades (different thickness, density or base paper combination) available on request.

FLM, PUMA

Pulp mixture	(FLM)kraft + manila mixture mixture/ (PUMA) pure manila
Tolerance thickness	± 10 % *
Tolerance density	± 10 % *
Chloride content	≤ 5 ppm *
pH-Value	6,0 ... 7,5 *
Conductivity	≤ 3 µS/cm *

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/15 mm ≥*	*V/µm for ref. only*	*mm/10min ≥*
	30	0,30	0,28	9,0	111,1	7	10	35
FLM	50	0,30	0,28	15,0	66,7	9	10	62
0.30	75	0,30	0,28	22,5	44,4	15	10	87
	90	0,30	0,28	27,0	37,0	17	10	110
	30	0,36	0,33	10,8	92,6	8	10	28
FLM	40	0,36	0,33	14,4	69,4	9	10	44
0.36	50	0,36	0,33	18,0	55,6	12	10	52
	60	0,36	0,33	21,6	46,3	15	10	70
	75	0,36	0,33	27,0	37,0	17	10	90
FLM	50	0,45	0,42	22,5	44,4	18	10	80
0.45	75	0,45	0,42	33,8	29,6	26	10	120

PUMA

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/ 15 mm ≥*	*V/µm for ref. only*	*mm/10min ≥*
PUMA	50	0,30	0,28	15,0	66,7	12	10	72
0.30								
PUMA	50	0,45	0,42	22,5	44,4	16	10	110
0.45	60	0,45	0,42	27,0	37,0	19	10	120
PUMA 0.50	50	0,50	0,47	25,0	40,0	20	10	100
PUMA	40	0,54	0,51	21,6	46,3	25	10	60
0.54	50	0,54	0,51	27,0	37,0	28	10	100
	60	0,54	0,51	32,4	30,9	31	10	100
PUMA	30	0,75	0,71	22,5	44,4	25	12	80
0.75	40	0,75	0,71	30,0	33,3	25	12	100

* GLT method

produced by:
Glatfelter Scaer S.A.S.

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MAE

Pulp mixture		special kraft / manila mixture
Tolerance thickness		± 10 % *
Tolerance density		± 10 % *
Chloride content		≤ 5 ppm *
pH-Value		6,0 ... 7,5 *
Conductivity		≤ 3 µS/cm *

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/ 15 mm* ≥	*V/µm for ref. only*	*mm/10min* ≥
MAE 0.54	40	0,54	0,51	21,6	46,3	18	10	80
	50	0,54	0,51	27,0	37,0	20	10	100

MAP

Pulp mixture		polyolefine fibres / manila mixture
Tolerance thickness		± 10 % *
Tolerance density		± 10 % *
Chloride content		≤ 5 ppm *
pH-Value		6,0 ... 7,5 *
Conductivity		≤ 3 µS/cm *

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/ 15 mm* ≥	*V/µm for ref. only*	*mm/10min* ≥
MAP 0.45	50	0,45	0,42	22,5	44,4	12	10	35

* GLT method

produced by:
Glatfelter Scaer S.A.S.

SMF

Pulp mixture	manila long fibre / special kraft
Tolerance thickness	± 10 % *
Tolerance density	± 10 % *
Chloride content	≤ 5 ppm *
pH-Value (1g/100ml)	6,0 ... 7,5 *
Conductivity (1g/100ml)	≤ 3 µS/cm *

Grade	Thick-ness	Density air dry	Density bone dry	B.W.	Yield	Tensile strength	BDV dry	md Water absorption
	µm	*g/cm³*	*g/cm³*	*g/m²*	*m²/kg*	*N/ 15 mm ≥*	*V/µm for ref. only*	*mm/10min ≥*
SMF	40	0,54	0,51	21,6	46,3	20	10	90
0.54	50	0,54	0,51	27,0	37,0	22	10	95
SMF	40	0,64	0,60	25,6	39,1	20	12	95
0.64	50	0,64	0,60	32,0	32,0	33	12	100

* GLT method

produced by:
Glatfelter Scaer S.A.S.

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Cable Paper

COPA CAB

Pulp mixture		100 % kraft pulp	
Tolerance thickness		± 10 %	
Tolerance density		± 0,05 g/cm³	
Tensile elongation		≥ 1,8 %	
pH-Value		6,0 7,5	
Conductivity		≤ 15 µS/cm	
Ash content		≤ 0,30 %	

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Breakdown voltage
	µm	*g/cm³*	*g/cm³*	*N/15mm* ≥	*V/µm* ≥
	20	0,70	0,66	13	15
	25	0,70	0,66	16	15
COPA	30	0,70	0,66	21	15
CAB	40	0,70	0,66	28	15
	50	0,70	0,66	33	15
	55	0,70	0,66	36	15

COPA CAB is our special cable paper grade for high voltage, low loss factor cable application.
Please find our standard cable paper COPA ISO on the next page under insulating paper.

Insulating Paper

COPA ISO

Pulp mixture	100% kraft pulp
Tolerance thickness	please see table below
Tolerance density	± 0,05 g/cm³
Tensile elongation	≥ 1,8%
pH-Value	5,5 7,5
Conductivity	≤ 50 µS/cm
Ash content	≤ 0,40%

Grade	Thickness	Density air dry	Density bone dry	Tensile strength	Break-down voltage	Thickness tolerance
	µm	*g/cm³*	*g/cm³*	*N/ 15 mm* ≥	*V/µm* ≥	*%*
COPA ISO						
Insulating Paper	30	0,70	0,66	23 N	10	+/- 10 %
machine finished	60	0,70	0,66	45 N	14	+/- 10 %
mach. trim : 1,70 m	63	0,75	0,71	50 N	14	+/- 10 %
	75	0,70	0,66	50 N	12	+/- 10 %
Available from 30 µm up to 75 µm as maximum thickness						
COPA ISO	30	0,95	0,90	35 N	19	+/- 15 %
Insulating Paper	40	0,95	0,90	55 N	17	+/- 15 %
calandered	50	0,95	0,90	65 N	15	+/- 15 %
machine trim: 1,60 m	Available from 30 µm up to 60 µm as maximum thickness					
COPA ISO	25 – 70 µm	1,00	0,95	-	-	-
	Available from 25 µm – 70 µm as max. , values upon inquiry					
COPA ISO	38	1,20	1,14	8.000/	15	+/- 15 %
	Available from 20 µm up to 60 µm as maximum thickness					

Testing methods

The various kinds of papers produced by SPO are tested during quality control using the following testing methods. Our measurement systems are calibrated through an Europe-wide comparative testing service. However, discrepancies can occur when comparing test results and specifications from different laboratories since these values often depend upon the equipment and method employed. We recommend therefore that the same laboratory is used for comparative results and we at SPO would be pleased to carry out such tests for you.

Thickness measurement:

The thickness measurement is done in accordance to ISO 534 for paper grades with a density of below 0.9 g/cm^3. The measuring gauge used for these grades has a circular shape with 1.6 cm diameter. The pressure exerted on the sample is 98 kPa. The micrometer used for grades with a density of 0.9 g/cm^3 and above exerts a force of 9 N on a spindle surface with a diameter of 7 mm. For thicknesses up to 30 µm a 10 layer sample is used, above 30 µm a 5 layer sample is used. The specimen used for the measurements consists of two sheets with the exact size of 400 cm² that are folded into one another to get the 10 or 5 layers. Each sample is measured at least five times to calculate the average value.

Determination of basis weight:

The samples of the thickness measurement are weighed using an analysis balance. The measuring precision amounts to 0,0001g. The result of the measurement is converted to g/m².

Determination of density:

The density is calculated using the following equation:

$$\rho = \frac{m_A}{s}$$

ρ : Density [g/cm³]
m_A : Basis weight [g/m²]
s : Thickness of the sample [µm]

Measurement of tensile strength and elongation:

This test is performed according to ISO 1924 using a tensile testing machine in a climate-room. Five samples are taken in machine-direction from every paper-roll which has to be tested. The width of sample strip is 15 mm. The samples have to remain in a climate-room for 24h. (23°C and 50% rel. RH) before testing. The time from the beginning of the stress until disruption of the sample should last 20 seconds (+/- 5sec.).

Determination of conducting particles:

With this testing method the conducting particles of the paper are checked. A layer of paper is placed on a sheet of brass (40 cm by 50 cm) acting as the negative pole. A brass roll connected to the positive pole is rolled over the paper surface with a speed of 0,14 m/s. The applied voltage is 110 V DC. The testing roll contains a lamp which records each conducting particle through a flash.

Dielectric strength test (BDV – break down voltage):

A two-layer-sample with an area of 25 cm by 40 cm is cut out of the paper and dried in a drying oven at 105°C for at least 30 min. Thereafter the sample is taken out of the oven and the measurement of the dielectric strength is performed immediately under ambient conditions by placing the paper sample between a sheet of aluminum that is the negative pole and a second electrode with a diameter of 50 mm that is the positive pole. The sample is subjected to an increasing voltage stress of 200 Volts DC per sec until disruptive discharge occurs. The final value of the applied voltage is noted.

The dielectric strength is calculated using the follwing equation:

$$U_D = \frac{U}{2 \cdot s}$$

U_D : Dielectric strength [V/µm]
U : Final voltage [V]
s : Thickness of the sample [µm]

Determination of absolute moisture content:

We specify a moisture content of 4-7 % on calandered papers (except pre-dried qualities) and < 4-7 % on machines finished papers. The values are determined with the follwoing method:

A sample of at least 15 g will be cut from of the paper roll. The exact weight of the sample is determined. After this the sample is dried in a drying oven at 105°C until the weight is constant and weighed again.

The moisture content is calculated with the following equation:

$$F_A = \frac{E - A}{E} \cdot 100\%$$

F_A : Absolute moisture [%]

E : Weight before drying [g]
A : Weight after drying [g]

Measurement of conductivity:

A water extract from 10 g of paper and 200 g deionized water is prepared by heating the glask in a boiling water bath for one hour. When the extract is cooled down to 25°C the conductivity is measured using electronic equipment. All papers produced by Papeteries de Cascadec are measured using 1 g of paper and 100 g deionized water.

Determination of pH-value:

To determine the pH-value the extract of the conductivity measurement is measured using electronic equipment.

Measurement of porosity:

1 dm² of the paper to be measured is painted with a test-ink. At the unpainted side gold spots become visible on porous points. The porosity is indicated by the quantity of spots per dm².

Determination of chloride content:

A water extract from 10 g of paper and 200 g deionized water is prepared by heating in a boiling water bath for one hour. The water extract is filtered and the chloride content of the filtrate is determined by ion chromatography.

Determination of water absorption:

The paper is cut into three samples of 15 mm width and about 200 mm length. Each sample is suspended vertically with its lower end dipped more than 4 mm in deionized water for 10 minutes. The maximum rise of water in the sample from above the water level is noted and the average of the three values is taken as the value for water absorption.

Conductive iron particles:

From the paper to be tested cut two samples to the size of 400 x 250 mm for a total sample area of 2000 cm^2. Spray the sample with 10% nitric acid solution (add one drop of 5% potassium permanganate to 100 ml of the 10% nitric acid solution). After 2 minutes spray the sample with 5% potassium ferrocyanide solution and let stand for 5 minutes. Count the number of iron particles which will have reacted with the reagents and become coloured Prussian blue. Count such particles separately from below 0.08 mm^2, from 0.08 – 0.1 mm^2 and more than 0.1 mm^2 in size.
The iron particles will appear as blackish blue specks within the blue areas. Measure the central blackish blue area only and do not measure the solution blotted area or the fibers which turned blue without the core.

Abbreviations:

B.W. = basis weight
BDV = breakdown voltage
Ref. = reference
MD = machine direction

Tolerance :

Roll widths	tolerance
≤ 10 mm	+/- 0,1 mm
>10 mm - ≤ 50 mm	+/- 0,2 mm
> 50 mm - ≤ 100 mm	+/- 0,3 mm
>100 mm - ≤ 200 mm	+/- 0,5 mm
>200 mm - ≤ 400 mm	+/- 1,0 mm
>400 mm - ≤ 500 mm	+/- 2,0 mm
>500 mm	+/- 3,0 mm

Delivery Tolerances - Delivery time and – quantity

If no other agreement has been made, we are offering the following standard tolerances on delivery time and delivery quantities.

Delivery Time

On time deliveries are fulfilled with the following tolerances on the confirmed delivery date :
- 5 working days / + 3 working days = 100 % on time delivery

Delivery Quantity- Tolerances

Order or delivery quantities are fulfilled with the following tolerances on the confirmed delivery (order) quantity:
50 - 999 kg order/delivery quantity = + 20 / - 5 % = order delivered
> 1.000 kg order/delivery quantity = + / - 10 % = order delivered

We only accept and confirm orders in accordance to our General Business Terms.

Storage Condition

We recommend a storage period of 1 year but only if the following conditions are fulfilled:
- storage only originally packed
- storage at room temperature (recommendation 18 - 25° C)
- storage at room climate (recommendation 45 - 55 % Humidity)
- storage with protection against temperature deviations, sunlight and damage

After 1 year storage we recommend to measure all relevant paper properties prior to processing.

Conversion table µm to inch:

µm	Inches		µm	Inches
6,5	0,000256		30	0,001181
8	0,000315		35	0,001378
9	0,000354		38	0,001496
10	0,000394		40	0,001575
12	0,000472		45	0,001772
14	0,000551		50	0,001969
15	0,000591		55	0,002165
16	0,000630		57	0,002244
18	0,000709		60	0,002362
20	0,000787		65	0,002559
22	0,000866		75	0,002953
24	0,000945		80	0,003150
25	0,000984		90	0,003543
26	0,001024		100	0,003943
28	0,001102		110	0,004331