SNAPSIC CAPAX

2 500 h / 105°C (up to 250 V)
10 000 h / 85°C (from 350 to 500 V)

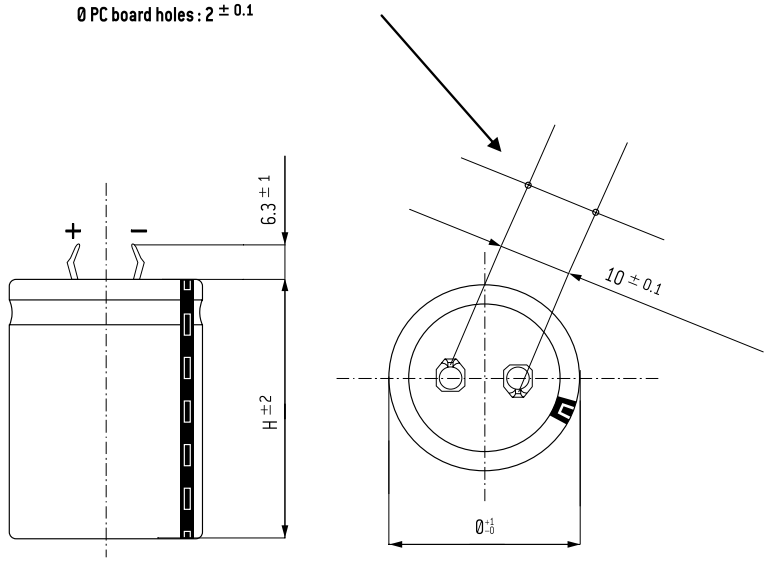
25 V ... 250 V	150 µF ... 47 000 µF	Ø 22 mm ... Ø 35 mm	– 55°C + 105°C	Long Life Time
350 V ... 500 V	33 µF ... 1 000 µF		– 55°C + 85°C	

APPLICATIONS

- For solid PC board mounting
- Switch mode power supplies
- Impulse current

Fixing : Printed SNAP-IN pins

Tolerance on capacitance at 20°C : ± 20 %
Operating temperature : $U_R \leq 250$ V : – 55°C + 105°C
$U_R \geq 350$ V : – 55°C + 85°C



Can size	Ø (mm)	H (mm)
1	22	25
2	22	30
3	22	40
4	25	25
5	25	30
6	25	40
7*	25	50
8	30	25
9	30	30
10	30	35
11	30	40
12*	30	45
13	30	50
14	35	30
15	35	35
16	35	40
17	35	45
18	35	50

* Out of range

Standard pins can be replaced by 4,5mm max pins on request

SPECIFICATIONS

CECC 30300 Long life
DIN 41 240 - Climatic category and GPF: –55 + 105°C / 56 days
IEC 60 384.4 long life

RESISTANCE TO VIBRATIONS

Frequency : 10 – 500 Hz
Displacement amplitude or : 0,75 mm
Max acceleration : 10 g – 98 m/s²
Duration : 3 x 10 sweep cycles

WITHSTAND STRENGTH OF INSULATING SLEEVE

Insulation resistance at 20°C between pins and mounting hardware : 100 MΩ
Test voltage at 50 Hz 1 min. between terminals and mounting hardware : 2000 V
Fire resistance : self extinguish 15 s (IEC 60 695-2-2)

SNAPSIC CAPAX

2 500 h / 105°C (up to 250 V)
10 000 h / 85°C (from 350 to 500 V)

Capacitance	Dimension		Can size	Tanδ 100 Hz +20°C max.	ESR 100 Hz +20°C Typic	Z 10 kHz +20°C Typic	II +20°C 5 min. max.	I ~ 100 Hz		Code
	Ø	H						+40°C max.	+105°C max.	
(µF)	(mm)	(mm)		(%)	(mΩ)	(mΩ)	(mA)	(A)	(A)	
Rated voltage 25 V										
4700	22	25	1	24	55	40	0,7	7,2	2,4	A 717022
6800	25	25	4	29	45	35	1	8,6	2,9	A 717025
10000	30	25	8	47	50	40	1,5	9,1	3	A 717028
22000	30	40	11	62	30	25	3	14	4,7	A 717032
33000	35	35	15	75	28	22	5	15	5,1	A 717034
47000	35	45	17	84	22	19	7	19	6,3	A 717036
Rated voltage 35 V										
3300	22	25	1	17	55	42	0,7	7,2	2,4	A 717042
4700	22	30	2	22	40	30	1	9	3	A 717043
4700	25	25	4	22	50	40	1	8,1	2,7	A 717045
6800	22	40	3	22	30	22	1,4	12	4	A 717044
6800	30	25	8	35	55	45	1,4	8,7	2,9	A 717048
10000	25	40	6	24	26	22	2,1	14	4,6	A 717047
10000	30	30	9	34	40	35	2,1	11	3,6	A 717049
15000	30	40	11	45	32	24	3,1	14	4,6	A 717052
22000	35	45	17	47	26	22	4,6	18	5,8	A 717056
33000	35	45	17	65	24	20	6,9	18	6,1	A 717057
Rated voltage 40 V										
2200	22	25	1	13	65	50	0,53	6,6	2,2	A 717062
3300	22	30	2	17	55	38	0,79	7,8	2,6	A 717063
4700	25	30	5	19	45	35	1,1	9,3	3,1	A 717066
5600	25	30	5	21	40	30	1,3	10	3,3	A 717069
5600	30	25	8	30	58	50	1,3	8,5	2,8	A 717068
6800	25	40	6	23	36	28	1,6	12	3,9	A 717067
10000	30	35	10	31	35	24	2,4	12	4,1	A 717070
15000	35	35	15	37	30	20	3,6	15	4,9	A 717074
22000	35	45	17	43	24	17	5,2	18	6,1	A 717076
Rated voltage 50 V										
1500	22	25	1	11	80	55	0,45	6	2	A 717081
2200	22	25	1	14	68	43	0,66	6,5	2,2	A 717082
3300	25	25	4	18	60	36	0,99	7,4	2,5	A 717085
4700	22	40	3	12	28	22	1,4	12	4,1	A 717084
4700	30	25	8	20	50	40	1,4	9,1	3	A 717088
6800	25	40	6	20	32	26	2	12	4,1	A 717087
6800	30	35	10	20	32	26	2	13	4,3	A 717090
10000	30	35	10	26	28	23	3	14	4,6	A 717091
15000	35	40	16	36	26	18	4,5	17	5,6	A 717095
22000	35	50	18	46	22	19	6,6	20	6,6	A 717098
Rated voltage 63 V										
1500	22	25	1	11	80	55	0,57	6	2	A 717101
2200	22	30	2	11	50	32	0,83	8,1	2,7	A 717103
2200	25	25	4	11	55	35	0,83	7,8	2,6	A 717105
3300	22	40	3	15	50	35	1,2	9,2	3,1	A 717104
3300	30	25	8	19	62	48	1,2	8,2	2,7	A 717108
4700	25	40	6	15	35	30	1,8	12	3,9	A 717107
4700	30	35	10	15	35	30	1,8	12	4,1	A 717110
6800	30	40	11	29	50	40	2,6	11	3,7	A 717111
6800	35	30	14	29	50	40	2,6	11	3,6	A 717113
10000	30	50	13	26	25	22	3	17	5,7	A 717112
10000	35	35	15	28	30	25	3	15	4,9	A 717114
10000	35	45	17	26	28	24	3	17	5,6	A 717116
Rated voltage 80 V										
1000	22	25	1	9	100	65	0,48	5,3	1,8	A 717122
1500	25	25	4	11	80	52	0,72	6,4	2,1	A 717125
2200	25	30	5	12	60	45	1,1	8	2,7	A 717126
3300	30	35	10	16	50	42	1,6	10	3,5	A 717130
4700	35	30	14	22	50	40	2,2	11	3,6	A 717133
6800	35	45	17	19	30	20	3,2	16	5,4	A 717136
8200	35	50	18	19	25	18	4	19	6,2	A 717137
10000	35	45	17	17	30	22	4,8	16	5,4	A 717138
Rated voltage 100 V										
470	22	25	1	6	130	75	0,29	4,7	1,6	A 717141
680	22	25	1	7	110	72	0,4	5,1	1,7	A 717142
1000	25	25	4	11	90	70	0,6	6,1	2	A 717145
1500	25	30	5	10	70	45	0,9	7,5	2,5	A 717146
1500	30	25	8	13	90	68	0,9	6,8	2,3	A 717148
2200	30	30	9	13	60	45	1,3	8,9	3	A 717149
3300	30	40	11	12	38	28	2	13	4,2	A 717152
3300	35	30	14	16	52	30	2	11	3,5	A 717153
3300	35	35	15	13	40	32	2	13	4,2	A 717154
4700	35	40	16	15	38	26	2,8	14	4,6	A 717155
6000	35	50	18	16	30	22	3,6	17	5,7	A 717158
6800	35	50	18	16	28	20	4,1	18	5,9	A 717159

SNAPSIC CAPAX

2 500 h / 105°C (up to 250 V)
10 000 h / 85°C (from 350 to 500 V)

Capacitance	Dimension		Can size	Tanδ 100 Hz +20°C max.	ESR 100 Hz +20°C Typic	Z 10 kHz +20°C Typic	II +20°C 5 min. max.	I ~ 100 Hz		Code
	Ø	H						+40°C max.	+105°C max.	
(µF)	(mm)	(mm)		(%)	(mΩ)	(mΩ)	(mA)	(A)	(A)	
Rated voltage 160 V										
330	22	25	1	19	600	430	0,32	2,2	0,7	A 717162
470	22	30	2	18	400	300	0,45	2,9	1	A 717163
680	25	30	5	13	200	140	0,66	4,4	1,5	A 717166
680	30	25	8	16	280	200	0,66	4,1	1,4	A 717168
1000	25	40	6	13	180	130	0,96	5,2	1,7	A 717167
1000	30	30	9	20	220	160	0,96	4,7	1,6	A 717169
1500	30	40	11	24	170	120	1,4	6	2,0	A 717172
2200	35	40	16	25	120	80	2,1	7,8	2,6	A 717175
Rated voltage 200 V										
220	22	25	1	12	600	400	0,26	2,2	0,7	A 717182
330	25	25	4	12	350	250	0,39	3,1	1	A 717185
470	25	30	5	10	200	160	0,56	4,4	1,5	A 717186
470	30	25	8	12	250	180	0,56	4,1	1,4	A 717188
680	25	40	6	12	220	170	0,81	4,7	1,6	A 717187
680	30	30	9	13	240	160	0,81	4,5	1,5	A 717189
1000	30	35	10	13	140	100	1,2	6,2	2,1	A 717190
1500	35	40	16	12	70	50	1,8	10	3,4	A 717195
2200	35	50	18	13	60	40	2,6	12	4	A 717198
Rated voltage 250 V										
150	22	25	1	10	650	460	0,22	2,1	0,7	A 717202
220	22	30	2	10	580	400	0,33	2,4	0,8	A 717203
330	25	30	5	10	220	180	0,5	4,2	1,4	A 717206
330	30	25	8	10	300	200	0,5	3,7	1,2	A 717208
470	30	30	9	10	200	120	0,7	4,9	1,6	A 717209
680	30	35	10	10	120	90	1	6,7	2,2	A 717210
1000	30	50	13	10	80	55	1,5	10	3,2	A 717212
1000	35	35	15	10	90	60	1,5	8,5	2,8	A 717214
1500	35	45	17	10	80	55	2,3	10	3,3	A 717216
Rated voltage 350 V										
100	22	25	1	8	700	520	0,21	2	0,7	A 717222
150	25	25	4	8	540	400	0,32	2,5	0,8	A 717225
220	25	30	5	8	350	230	0,46	3,3	1,1	A 717226
330	30	30	9	8	260	170	0,69	4,3	1,4	A 717229
470	30	35	10	8	160	100	1	5,8	1,9	A 717230
680	35	35	15	9	140	120	1,4	6,8	2,3	A 717234
1000	35	50	18	10	80	60	2,1	10	3,5	A 717236
Rated voltage 400 V										
68	22	25	1	8	1200	850	0,65	1,5	0,5	A 717242
100	22	30	2	9	950	650	0,8	1,9	0,6	A 717243
150	30	25	8	10	700	520	1	2,4	0,8	A 717248
220	25	40	6	10	500	400	1,2	3,1	1	A 717247
220	30	30	9	10	500	360	1,2	3,1	1	A 717249
330	30	35	10	10	350	240	1,5	3,9	1,3	A 717251
330	30	40	11	10	320	230	1,5	4,3	1,4	A 717252
470	35	35	15	10	220	160	1,8	5,4	1,8	A 717254
470	35	40	16	10	200	150	1,8	6	2	A 717255
560	35	45	17	10	180	130	1,9	6,7	2,2	A 717256
680	35	50	18	12	150	110	2,1	7,6	2,5	A 717258
Rated voltage 450 V										
33	22	25	1	8	2200	1600	0,7	1,1	0,4	A 717260
47	22	25	1	8	1800	1300	0,8	1,3	0,4	A 717261
68	22	25	1	10	1600	1100	1	1,3	0,4	A 717262
100	25	25	4	13	1400	1000	1,3	0,8	0,3	A 717265
100	25	30	5	11	1200	950	1,3	1,8	0,6	A 717266
150	22	40	3	14	1000	700	1,6	2,1	0,7	A 717264
150	25	30	5	14	1000	700	1,6	2	0,7	A 717267
220	25	40	6	12	600	400	1,9	2	1	A 717268
220	30	30	9	10	500	330	1,9	3,1	1	A 717269
220	30	35	10	10	450	300	1,9	3,5	1,2	A 717270
330	30	40	11	12	400	280	2,3	3,9	1,3	A 717272
330	35	30	14	14	450	310	2,3	3,6	1,2	A 717273
330	35	35	15	12	400	280	2,3	4	1,3	A 717274
470	35	40	16	12	280	200	2,8	5,1	1,7	A 717275
560	35	50	18	12	220	170	3	5,8	1,9	A 717278
680	35	50	18	12	160	120	3,3	7,5	2,5	A 717279

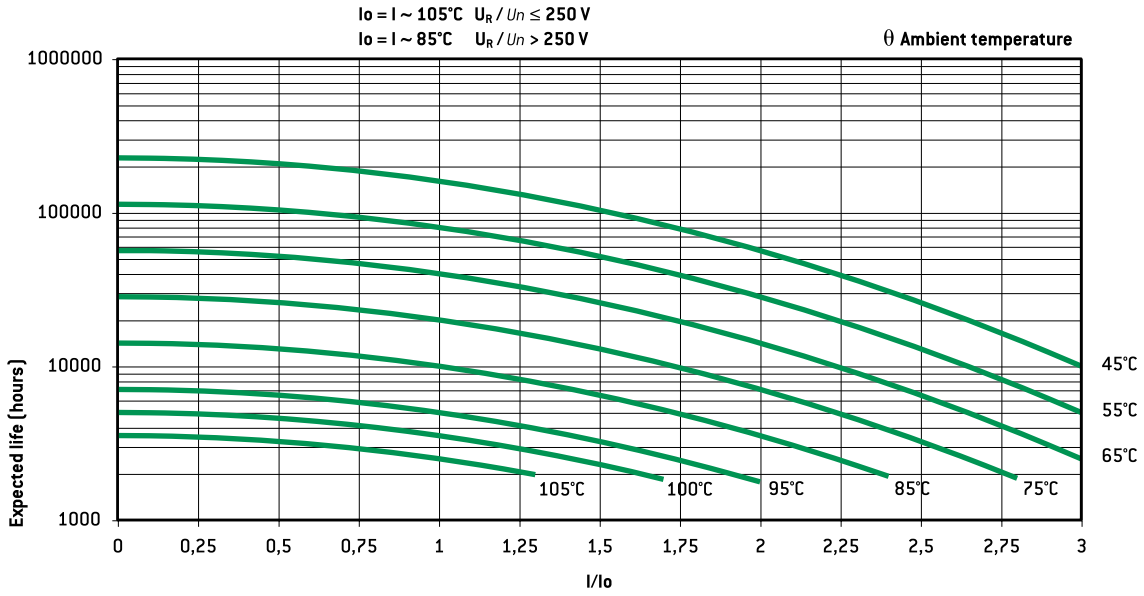
SNAPSIC CAPAX

2 500 h / 105°C (up to 250 V)
10 000 h / 85°C (from 350 to 500 V)

Capacitance (µF)	Dimension Ø (mm)	Dimension H (mm)	Can size	Tanδ 100 Hz +20°C max. (%)	ESR 100 Hz +20°C Typic (mΩ)	Z 10 kHz +20°C Typic (mΩ)	I 5 min. +20°C max. (mA)	I ~ 100 Hz +40°C max. (A)	I ~ 100 Hz +105°C max. (A)	Code
Rated voltage 500 V										
33	22	25	1	14	4500	3000	0,77	0,8	0,3	A 717282
47	22	30	2	12	2600	1700	0,92	1,1	0,4	A 717283
68	25	30	5	12	1700	1200	1,1	1,5	0,5	A 717286
100	25	40	6	12	1200	700	1,3	2	0,7	A 717287
100	30	30	9	12	1200	700	1,3	2	0,7	A 717289
150	30	35	10	12	900	580	1,6	2,5	0,8	A 717290
220	35	35	15	12	600	450	2	3,3	1,1	A 717294
330	35	45	17	12	360	250	2,4	4,7	1,6	A 717296

EXPECTED LIFE

as a function of temperature and ripple current:



PERMISSIBLE RIPPLE CURRENT I (R.M.S. VALUE)

versus frequency ƒ :

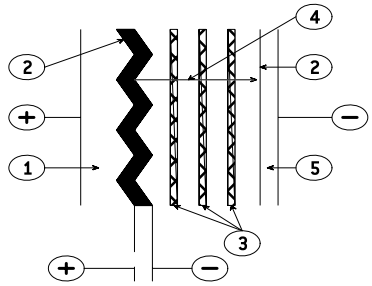
I ~ : permissible r.m.s. current at 100 Hz

ƒ(Hz)	50	100	300	600	1 000	10 000	≥ 50 000
I	0,8 x I~	I~	1,2 x I~	1,3 x I~	1,35 x I~	1,5 x I~	1,6 x I~

General technical data

1. BASIC CONSTRUCTION

Structure of an electrolytic aluminum capacitor is shown hereunder :



1. Anode : aluminum foil
2. Dielectric : aluminum oxide
3. Papers spacers impregnated with electrolyte
4. Ionic conduction assumed by electrolyte
5. Cathode : aluminum foil

The positive plate is an etched aluminum foil covered with alumina which is the dielectric of the capacitor.

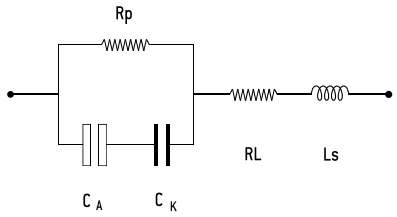
The negative plate is constituted by a second aluminum foil which serves as a current supply, and by electrolyte-impregnated papers layers.

The metal used for anode is a ≥ 99,98 % grade aluminum.

The dielectric has a thickness of 13 Å / V.

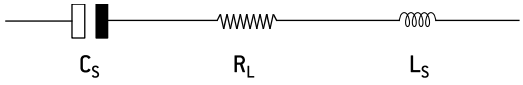
The aluminum used for the cathode is a ≥ 98 % grade aluminum covered with a dielectric layer with a thickness of about 40 Å.

2. DIAGRAM OF THE EQUIVALENT CIRCUIT



CA = Capacitance of the anode
CK = Capacitance of the cathode
Rp = Parallel resistance due to the aluminum oxide f llms.
RL = Series resistance of connections, plates and impregnated spacer.
Ls = Inductance of winding and connections.

A standard simplified diagram is.



Cs is the series capacitance of both anode and cathode capacitances.
Electrolytic aluminum capacitors are naturally polarized because of the insulating f llm on the anode. Given the very thin aluminum oxide layer, a reversed voltage should not exceed 1.5 V when there is energy supply.

Short duration reverse voltages can be absorbed by special construction, second anode replacing the former cathode.

3. CAPACITORS MARKING

3.1. ARTICLE CODE (ON EACH PACKAGING)

A followed by 6 figures number. First 3 positions are specific of the range. (Ex. A 745xxx for a FELSIC 85 BD)

140	FELSIC en batterie / in bank	741	FELSIC 125 FRS BD (ex 731)
701	PRORELSIC 125	742	PRORELSIC 105 TFRS
703	PRORELSIC 125	743	PRORELSIC 105 TFRS
704	SNAPSIC	744	FELSIC 85 BC / FELSIC 85 LP
705	SNAPSIC 105	745	FELSIC 85 BD
706	FELSIC HP BC – BD	746	FELSIC 85 M BC
708	PRORELSIC 145	747	FELSIC 85 M BD
710	CUBISIC	748	SICAL CO 42 - SICAL
711	PROMISIC 031	749	SICAL CO 42 - SICAL
712	CUBISIC LP	750	CUBISIC 125
713	SNAPSIC 105 LP	756	FELSIC 105 BC / FELSIC 105 LP
714	SNAPSIC 4P	757	FELSIC 105 BD
715	SNAPSIC 105 4P	760	FELSIC CAPAX BC
716	SNAPSIC HV	761	FELSIC CAPAX BD
717	SNAPSIC CAPAX	762	FELSIC 105 TFRS BC
718	SNAPSIC 125	763	FELSIC 105 TFRS BD
721	RELSIC 033	764	FELSIC HV BC
722	CI FRS	765	FELSIC HV BD
723	CI FRS	775	VACSIC
728	FELSIC 039 (ex 727) - FELSIC DI	774	VACSIC 150
738	FELSIC 037 (ex 737)	776	ALSIC 20G / ALSIC 145 20G
740	FELSIC 125 FRS BC (ex 731)		

In FELSIC ranges, article code without first letter A, is printed on each capacitor.
a Figure 9 in fourth position shows a special product.

3.2. BATCH (ON EACH CAPACITOR).

3 figures or 6 figures

3.3. DATE (ON EACH CAPACITOR IF APPLICABLE)

4 figures (year-week)

4. ELECTRICAL CHARACTERISTICS

4.1. RATED CAPACITANCE C_R

The rated capacitance is defined at 100 Hz and at ambient temperature.

4.2. RATED VOLTAGE U_R

U_R is the maximum DC voltage which may be applied in continuous operation.
When applying a superimposed alternating voltage, the peak value of the resulting waveform should not exceed the rated voltage.

4.3. PEAK VOLTAGE U_P

Up is the maximum repetitive voltage which can be applied within short periods.
Defined in CECC 30 300 and IEC 60 384-4 :

1000 cycles of 30 s charge followed by a no load period of 5 min. 30 s with upper category temperature.

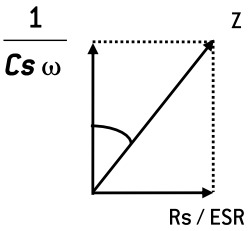
$Up \geq 1{,}15\ U_R$ ($U_R \leq 315$ V)
$Up \geq 1{,}10\ U_R$ ($U_R > 315$ V)

General technical data

4.4. DISSIPATION FACTOR TANδ

The dissipation or loss factor is defined by its tangent Tanδ

$$Tg\delta = Rs \quad Cs\,\omega \qquad (\omega = 2\pi F)$$



ESR Capacitor Equivalent Series Resistance
Cs Capacitor capacitance
F Frequency (100 Hz)
Z Capacitor impedance

4.5. EQUIVALENT SERIES RESISTANCE ESR

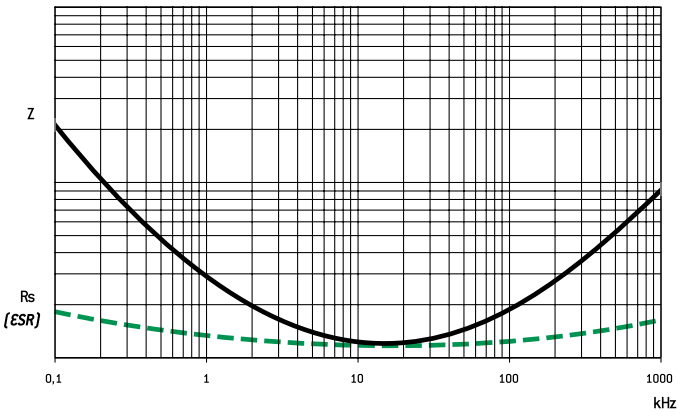
The relation between ESR and dissipation factor Tanδ is given in § 4.4.

4.6. IMPEDANCE Z - INDUCTANCE L

The impedance is given by :

$$Z = \sqrt{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}$$

L inductance. Generally L = 5 to 20 nH



Z and ESR as function of frequency typically follows the chart :

4.7. PERMISSIBLE RIPPLE CURRENT (I r.m.s.) I~

The current is defined at the maximum climatic category and at 100 Hz. It is the root mean square value r.m.s. The value I_0 is the rated value for calculations of expected life up to3 I_0.

4.8. LEAKAGE CURRENT Il

Il is measured at 20°C after a 5 min. polarization under rated voltage.

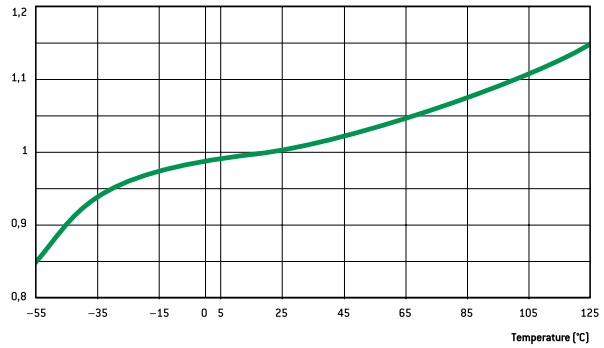
For C_R in µF and U_R in V :
$Il \leq 0{,}01\ C_R\ U_R$ or 1 µA*
when $C_R\ U_R \leq 1000$ µC
$Il \leq 0{,}006\ C_R\ U_R + 4$ µA
when $C_R\ U_R > 1000$ µC
For $U_R > 350\ V_{DC}$ it can be specified :
with K = 4, 6 or 8
or
$Il \leq 0{,}3\ (C_R\ U_R)^{0,7} + 4$ µA (CECC 30 300)
* Whichever is the greater

4.9. CHARACTERISTICS

Versus temperature (typical values).

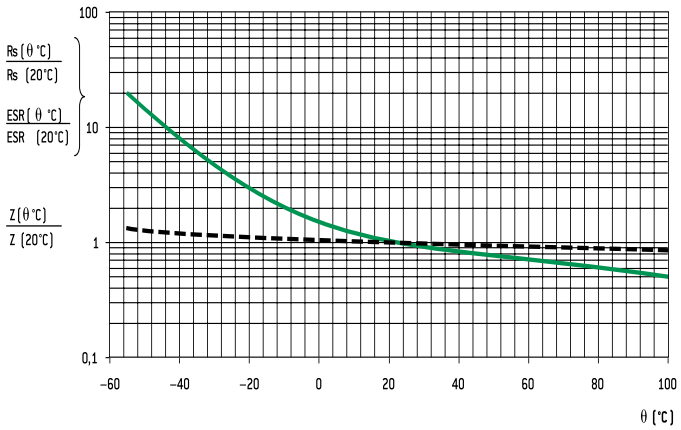
4.9.1. Capacitance drift

Versus temperature



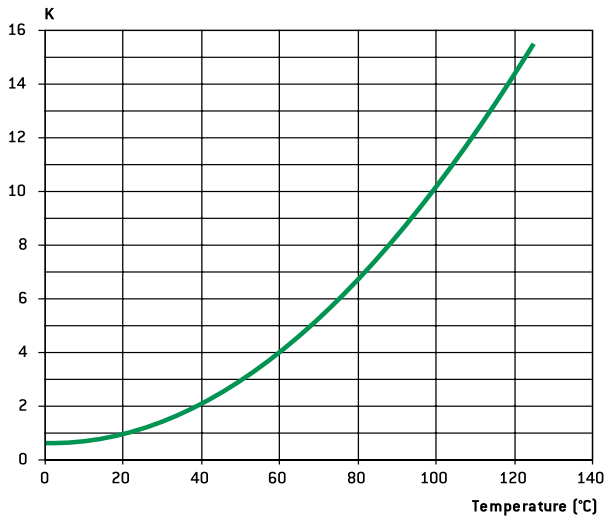
4.9.2. ESR and Z drifts at 100 Hz

Versus temperature



4.9.3 Leakage current drift

Versus temperature



General technical data

5. SPECIFICATION TO APPLY

Electrolytic aluminum capacitors are defined in :

- NF and UTE French national standard
- CECC European specifications
- IEC international specifications

Quality insurance procedures are described in these specifications.

	French	European	International
Generic specification Fixed capacitors	NF C 83 100	CECC 30 000 EN 130 000	IEC 60 384 -1 QC 300 000
Sectional specification Electrolytic aluminum capacitors	NF C 83 110	CECC 30 300	IEC 60 384 - 4 C 300 300
Blank deta ll specification - Electrolytic aluminum capacitors with non solid electrolyte /	UTE 83 110	CECC 30 301	IEC 60 384 - 4 -1 QC 300 301
Blank deta ll specifications	CECC 30 301- 017 to CECC 30 301- 062 CO 31 to CO 55	CECC 30 301- 017 to CECC 30 301- 062 CECC 30 301- 802 to CECC 30 301- 811	

6. ENDURANCE TESTS / LIFE TIME

6.1. STANDARD ENDURANCE TEST

at max category temperature :

Temperature	Endurance test			
	Grade I - Long life			Grade II - General purpose
	10 000 h	5 000 h	2 000 h	1 000 h
125°C			•	
105°C		•	•	•
85°C	•	•	•	•

Standard endurance tests do not exceed 2000 hours at 125°C. However, present EXXELIA SIC SAFCO technologies concerning liquid electrolytes have led to endurance tests up to 5000 hours at 125°C (PRORELSIC 125 - FELSIC 125 RS) and even 20000 hours at 125°C (PRORELSIC 145 - ALSIC 145)

6.2. PERFORMANCE REQUIREMENTS ON STANDARD ENDURANCE TESTS.

Permissible capacitance drift $\Delta C/C$ (%)

Permissible increase factors on Tanδ, ESR, Z and ll initial values

U_R	Endurance test			
	Grade I			Grade II
	10 000 h	5 000 h	2 000 h	1 000 h
6,3 V			+15 –30	+25 –40
10 V - 35 V	+15 –20	±15	±15	±30
40 V - 160 V	±15	±15	±15	±30
> 160 V	±15	±10	±10	±15

	Endurance test			
	Grade I			Grade II
	10 000 h	5 000 h	2 000 h	1 000 h
Tanδ or ESR (1)	1,5	1,3	1,3	1,5
Z (2)	3	2	2	3
ll	Standard values			

(1) Tanδ or ESR : for initial value, take standard value.

(2) Z : for initial value, take specified value (see data sheet).

Specific requirements can be taken into consideration with regards to initial values of dissipation factor or equivalent series resistance and impedance.

6.3. FAILURE CRITERIA FOR ELECTROLYTIC CAPACITORS.

Failure criteria are defined in CECC 30 301

- Non measurable defaults leading to complete failure.
- Measurable defaults leading to adjustment losses of the load circuit (failure due to variations).

6.3.1. Non measurable defaults.

They might be summed up as :

- Open circuit
- Short circuit
- Operation of pressure relief device
- Severely damaged insulation
- Unusable terminations

6.3.2. Measurable defaults.

Variations exceeding the values given below characterize a default.

- Capacitance drift $\Delta C/C$ (%) : 3 times the limit for standard endurance testing or 50 % (whichever is the smallest).
- Tanδ or ESR : 3 times standard max initial values.
- Z : 3 times standard max initial values.
- ll : initial limit (under load conditions).

Specific requirements can be taken into consideration with regards to lower drifts.

6.4. INFLUENCE OF MAIN PARAMETER ON OPERATIONAL LIFE.

6.4.1. Temperature.

The capacitors operational life is highly dependent upon its internal temperature Θi and therefore upon the ambient temperature and the ripple current.

Knowing ESR and dissipated power values (§ 6.4.3.) one can figure out, the internal temperature rise and then determine the capacitors expected life.

With present high bo lling point electrolytes (§ 8.6)

Θi max = 125 to 185°C depending on styles.

6.4.2. Ripple current.

The ripple current flowing through the capacitor increase the internal temperature through power dissipation.

Standards define the permissible current at 100 Hz and generally consider a temperature rise of 5 to 10°C of max category temperature.

Current waveforms and frequencies make it difficult to clearly determine the capacitors internal temperature rise, which defines the operationally life.

Experiments confirm following relationship :

$$\Theta i = \Theta a + (\Theta c - \Theta a)\, K$$

Where :

- Θi = Internal hot spot temperature
- Θa = Ambient temperature
- Θc = Case temperature
- K = Parameter depending upon case diameter and cooling

  $\varnothing \geq 51$ k = $2^{\pm 0,5}$

  $\varnothing < 51$ k = $1,5^{\pm 0,5}$ (air cooling - 0,2 m/s)

General technical data

r.m.s. value according to current waveform.

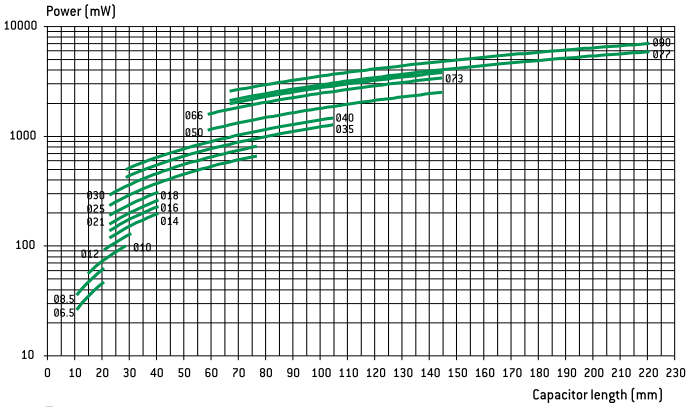
Function	Mean value	R.m.s. value
	A (t0/T)	$A\sqrt{t_0/T}$
	A (t1/T)	$A\sqrt{2t_1/3T}$
	A/2 (t0/T)	$A\sqrt{t_0/3T}$

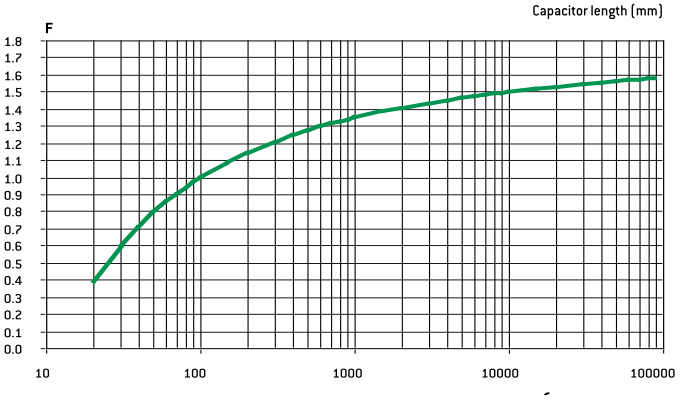
Function	Mean value	R.m.s. value
	A/2	$A\sqrt{3}$
	2A/π (t0/T)	$A\sqrt{t_0/2T}$
	A/2 (t0/T)	$A\sqrt{t_0/3T}$

Function	Mean value	R.m.s. value
	2A/π	$A/\sqrt{2}$
	A/2	$A/\sqrt{3}$
	0	A

6.4.3. Dissipated power versus case dimension

For calculations of ripple currents, considering an internal temperature rise of 10°C





$P = ESR.I^2$

P = Dissipated power (mW)

($\Theta i - \Theta a = 10°C$)

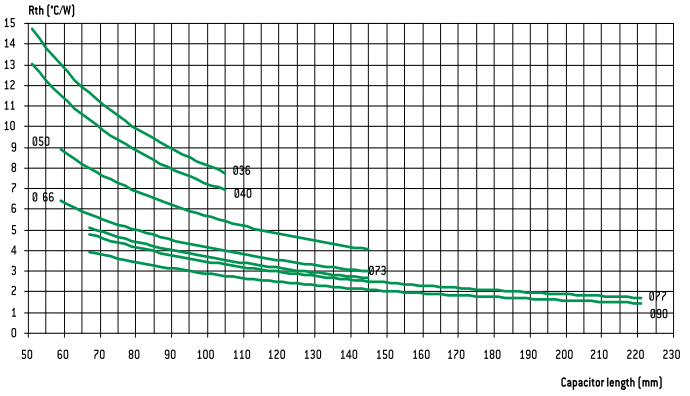
ESR : Equivalent series resistance (100 Hz 20°C)

I : Ripple current (r.m.s. value at 100 Hz)

For different frequencies from 100 Hz, I must be multiplied by the factor F, according to above chart. :

6.4.4. Thermal resistance Rth and air cooling

Rth is static thermal resistance (without cooling) between capacitor central hot spot and ambient temperature measured at a distance of one capacitor diameter



Forced or not cooling air can lead to a significant decrease of these values.

Consequently, r.m.s. ripple current can be increased as a function of air cooling speed :

Ø (mm)	≤ 0,5 m/s	1 m/s	2 m/s	3 m/s	≥ 4 m/s
66 - 90	I~	1,1 I~	1,2 I~	1,25 I~	1,3 I~
36 - 51	I~	1,2 I~	1,4 I~	1,45 I~	1,5 I~

This parameter shall be applied to one capacitor alone.

For capacitors in bank, ambient temperature must be strictly equal around all capacitors.

6.4.5. Quality guaranty

We guarantee products manufactured during 2 years from the data of shipment against defaults of material and assembly.

This guaranty can be involved by the buyer only if our products are used within normal conditions, always according to the state of the art and taking in account storage conditions.

The equipment design should take into consideration possible failures of our capacitors and related effects in order to avoid them.

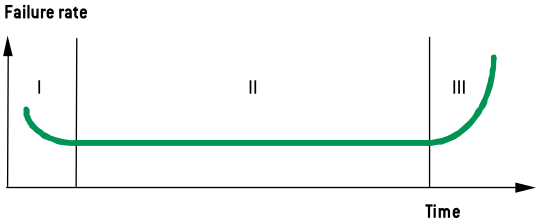
Guaranty is not applicable for damages occurred by surge voltage, irregular use, polarity inversion or maintenance default.

Guaranty is exclusively limited to the replacement of individual defective capacitors within the terms of delivery. This rule applied to all cases and particularly to any further consequence of failures.

6.4.6. Reliability

Failure rate :

$$FR = \frac{\text{Number of components tested x test duration}}{\text{Number of failures}}$$



Failure rate is measured in FIT (failure in time = 10^{-9} / hour).

The failure rate is set up during the life time of the capacitor (phase II)

I. Early failure phase (generally excluded during ageing process).

II. Operational life time of the capacitors

III. End of life

General technical data

Mean time between failures MTBF = 1/FR mesured in years

Range	Failure rate for a failure percentage not exceeding 1% with a confidence level of 60 %
FELSIC 85 >350 V FELSIC CAPAX > 350 V SNAPSIC - SNAPSIC CAPAX > 350 V SNAPSIC 4P > 350 V PROMISIC 031 Ø = 6,5 SICAL CO 42 - SICAL > 350 V	50 FIT - (MTBF = 2280)
FELSIC 037 - 039 FELSIC 85 ≤ 350 V FELSIC CAPAX ≤ 350 V CUBISIC CI FRS SNAPSIC 105 - SNAPSIC 105 4P SNAPSIC 105 LP - SNAPSIC HV SNAPSIC - SNAPSIC 4P ≤ 350 V SNAPSIC CAPAX ≤ 350 V ALSIC IR - ALSIC 145 - ALSIC HV - VACSIC 150 - VACSIC SICAL CO 42 - SICAL ≤ 350 V PRORELSIC 125 Ø = 6,5 RELSIC 033 PROMISIC 031 Ø > 6,5	25 FIT - (MTBF = 4560)
FELSIC 125 FRS - SNAPSIC 125 FELSIC HV - FELSIC 105	10 FIT - (MTBF = 11410)
PRORELSIC 125 Ø > 6,5 PRORELSIC 145	5 FIT - (MTBF = 22820)

Multiplying factor of FR with voltage and temperature

	Temperature (°C)							
	≤ 40	50	60	70	85	105 (1)	125 (1)	145 (1)
Factor	1	1,5	2,3	3,4	6,3	14	32	72

(1) Only for permitted capacitors

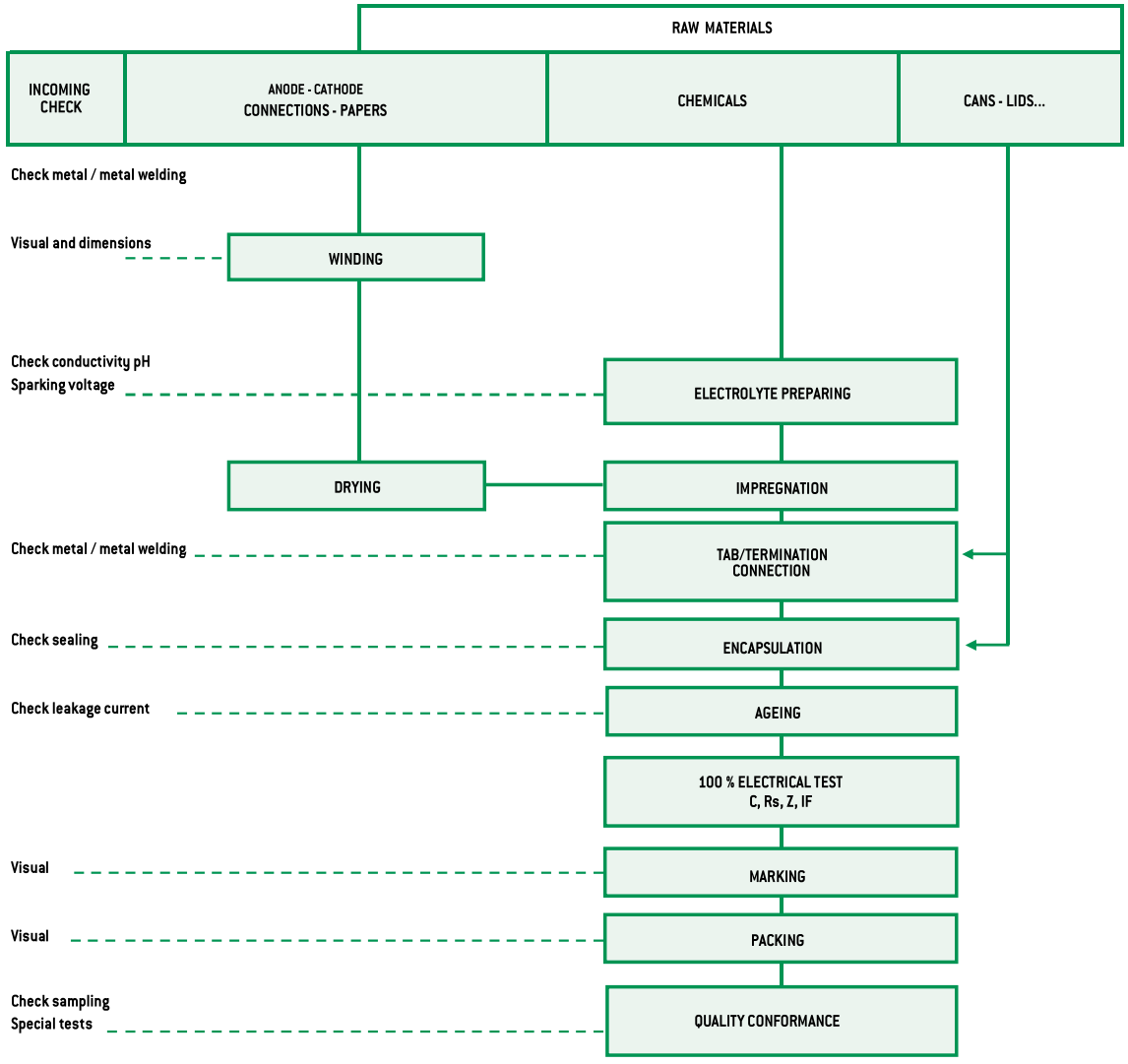
	Percentage of rated voltage (2)		
	100 %	80 %	50 %
Factor	1	0,8	0,5

(2) This voltage has to be constant

Environment	Without vibration		Ground with vibrations or mob lle			
	Ground, fix Controlled air	Ground, fix	PRORELSIC SNAPSIC 20 g FELSIC 20 g	FELSIC 10 g PROMISIC SICAL Ø ≤14	CI FRS - SNAPSIC RELSIC SICAL Ø >14	ALSIC
Factor	1	2	2	4	6	12

7. MANUFACTURING FLOW CHART

Process controls



General technical data

8. INFORMATION ON APPLICATION

8.1. CLEANING SOLVENTS

Use aliphatic alcohols, such as denatured ethyl alcohol, isopropanol, or butylacetate, or else alkaline d lluted solutions. Avoid incompatible solvents (halogenous for example).

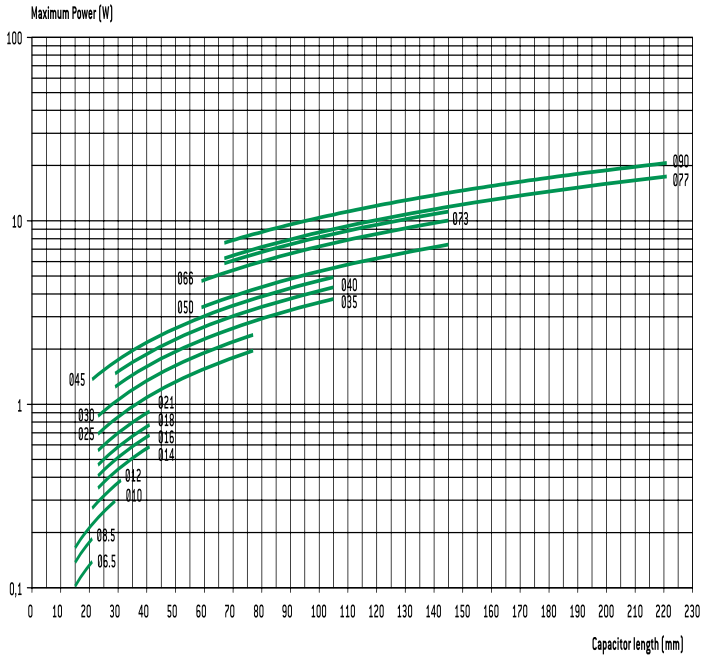
8.2. SHELF LIFE

There is no electrical characteristics variation for long periods of storage except leakage current which can increase.

It is caused by chemical reactions between the dielectric alumina and the electrolyte. These reactions are reversible when switched on. Capacitors can generally be stored at temperature between –5° and +50°C without reforming for the following periods of time :

- For $U_R \leq 100$ V, storage time : ..... 5 years (up to 10 years under specific conditions)
- For 100 V < $U_R \leq 360$ V storage time : ..... 3 years
- For 360 V < $U_R < 500$ V storage time : ..... 1 year
- For $U_R \leq 500$ V, storage time : ..... 6 months

Generally when these periods are overstepped, one hour at rated voltage causes the decrease of leakage current under the specified limits. An other way to avoid this leakage current increase problem is to always limit ava llable power through capacitor during first seconds or minutes after storage or transport, according to the following chart :



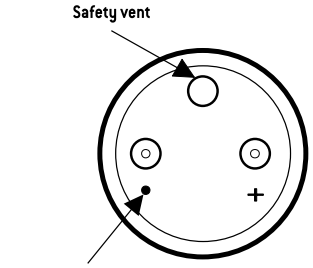
8.3. LOW PRESSURE RESISTANCE

EXXELIA SIC SAFCO capacitors can be used with ambient low pressure decreasing up to 10 mbar (altitude 28000 m – 92000 feet).

8.4. MOUNTING SCREW TERMINALS CAPACITORS (FELSIC)

Capacitors may be used vertically (terminals on top) or horizontally. When used horizontally, the following position in relation to the safety vent, is recommended :

Mounting capacitors in series may be used for operating voltage exceeding U_R. See FELSIC in bank



Prominent negative polarity indicator (except Ø 90)

8.5. MOUNTING SOLDER TYPE CAPACITORS.

They may be used in any position. During mounting, avoid applying excessive force to capacitor pins or wires. There is a risk of damaging internal connections.
After soldering and for the same reasons, do not try to move the capacitor's body.

8.6. ELECTROLYTES : SAFETY RULES.

Electrolytes used in EXXELIA SIC SAFCO capacitors are manufactured by EXXELIA SIC SAFCO. Main solvents are generally γ butyrolactone and ethylene glycol, very stable high bo lling point solvents. Ionic conductive salts in electrolyte induce a very weak acidity (pH 5 to 7).

8.7. ENVIRONMENT.

- There is no possib llity to produce gaseous emissions of nitrogen oxides or liquid emissions of nitrites or nitrates during the manufacture process.
- There is no possib llity to produce liquid emissions or salts coming from dangerous metals such as mercury, hexavalent chromium or cadmium and from poisons such as arsenic or cyanides.

Accessories not made in aluminum, ring, screw, are also plated in anticorrosion processes without cadmium.

EXXELIA SIC SAFCO is always involved in this security field particularly in using whenever it's possible chemicals for electrolyte, without well-known risks.

- Dimethylformamide (DMF) dangerous solvent forbidden in several uses is completely excluded by EXXELIA SIC SAFCO, since 1990.
- There is no halogen compound such as chlorofluorocarbon (CFC or FCKW in german) or polychlorobiphenyl (PCB-Pyralene) or pentabromodiphenylether or octabromodiphenylether.

There is neither benzene, toluene or phenyl compound nor explosive such as picric acid, nor asbestos in plastic covers.

All the capacitors made by EXXELIA SIC SAFCO since 1991, can be scrapped or used in raw materials recycling processes with-out special care.

EXXELIA SIC SAFCO aluminum capacitors with non solid electrolyte are particularly suitable for different kinds of environment taking in account severity increasing laws.

European directives 2003/11/EC, 2002/96/EC (WEEE) and 2002/95/EC (RoHS) applies to all EXXELIA SIC SAFCO capacitors including every solder type, manufactured with pure tin coated pins or wires, since at least January 2006.

EXXELIA SIC SAFCO capacitors do not contain any carcinogen, mutagen and substance toxic for reproduction in accordance with 1907/2006/EC (REACH) European directive target.

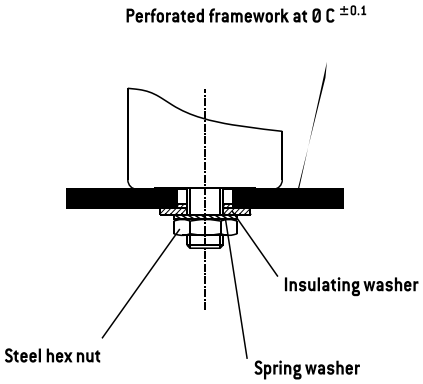
Mounting and insulating parts

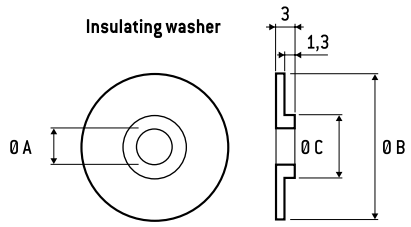
STUD FIXING : FELSIC BD

Steel nut, spring washer and insulating washer are delivered loosely with the capacitor.

STANDARD MOUNTING WITH :

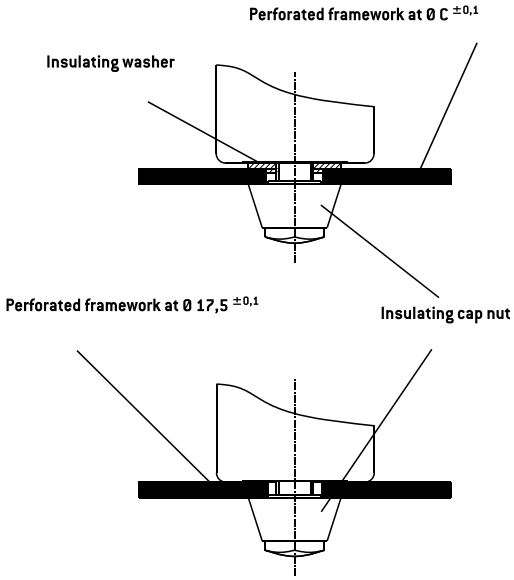
Insulating washer and steel nut

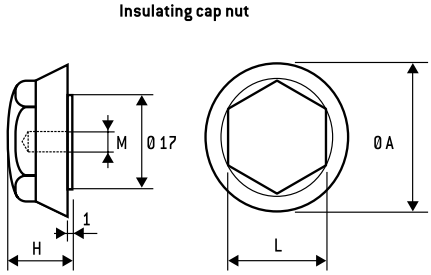




Ø Capacitor	Dimension (mm)				
	M	Ø A	Ø B	Ø C	Code
36	8	8,4	25	18,5	A 691060
51 - 77	12	12,5	30	21,5	A 691061
90	12	12,5	35	21,5	A 691062

Insulating plastic nut with or without insulating washer

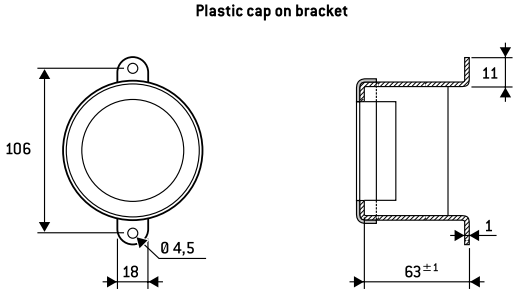




Dimension (mm)					
M	Ø A	H	L	Max. torque	Code
8	25	15	17	3 Nm	A 691070
12	30	20	19	7 Nm	A 691071

Ring - clip mounting : FELSIC LP

Ring clips shall be ordered separately.
Tightening screws and nuts are supplied loosely.



FELSIC 85 LP FELSIC 105 LP	Code
Metal bracket	A691055
Plastic cap	A691065

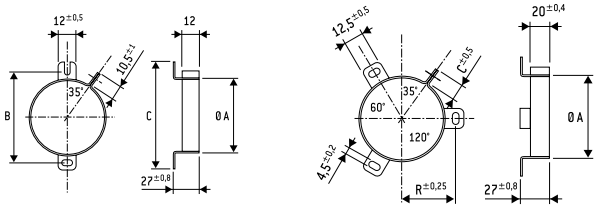
General technical data

Ring - clip mounting : FELSIC BC

Ring clips shall be ordered separately.

Tightening screws and nuts are supplied loosely.

FELSIC BC - Metal ring-clips



Ø A Cap.	B	C	Code
36	54	63	A 691901

Ø A Cap.	B	C	Code
51	33,5	11,8	A 691905
66	39	10,5	A 691913
73	44	10,5	A 691914
77	44,5	10,5	A 691907
90	53,3	11,8	A 691915

Stirrup mounting : CUBISIC LP

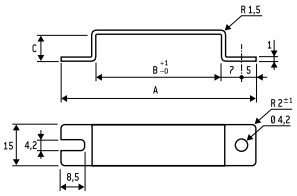
Stirrups shall be ordered separately.

Tightening screws and nuts are supplied loosely

Salt mist endurance of screws and mounting accessories :

minimum 96 h (IEC 600 68-2-11)

CUBISIC /CUBISIC LP - Metal bracket



Ø A Cap.	A	B	C	Code
45x12	69	45	10	A 691057
35x16	59	35	14	A 691059

PACKAGING

1. PACKAGING AND WEIGHT UNITS.

1.1. Capacitor with screw terminals

Case dimensions				Unit weight *
Ø	H			(g)
36	47	52	53	70
36	60			79
36	80	81		100
36	104	105		120
51	47			80
51	62	63		105
51	81	82		190
51	104	105		260
51	112			270
51	144			370
66	104	105		430
66	112			460
73	104	112		600
73	144			680
77	104	105		620
77	144	145		860
77	200			1300
77	220	221		1400
90	67			600
90	144	145		1400
90	200			1800

* Unit weight = typical values

Possibles variations of = ± 25 % according to different voltage and capacitance.

1.2. Radial solder types

Case dimensions		ALSIC	SNAPSIC
Ø (mm)	H (mm)	Weight* (g)	Weight* (g)
10	16	1,8	
12,5	21	4,5	
12,5	24	5	
16	25	8,2	
22	25		15
22	30		17
22	40		18
25	25		17
25	30		20
25	35		22
25	40		25
25	45		28
25	50		30
30	25		28
30	30		30
30	35		30
30	40		40
30	45		45
30	50		50

Case dimensions		ALSIC	SNAPSIC
Ø (mm)	H (mm)	Weight* (g)	Weight* (g)
35	30		50
35	40		50
35	45		52
35	50		60
35	75		95
35	100		125
40	40		65
40	50		100
40	75		130
40	100		170
45	21		50
45	25		60
45	30		73
45	35		85
45	45		110
45	75		180
45	100		240

Case dimensions			CUBISIC
I	L	H	weight (g)
35	35	16	30
35	50	16	40
45	35	12	30
45	50	12	45
45	75	12	60

* Unit weight = typical values

Possibles variations of = ± 25 % according to different voltage and capacitance.

1.3. Axial types

Case dimensions		PRORELSIC RELSIC	PRORELSIC PROMISIC	SICAL CO 42 SICAL
Ø (mm)	H (mm)	Unit weight * (g)	Unit weight * (g)	Unit weight * (g)
6,5	15		1,6	
6,5	19		1,8	1,8
8,5	19		2,3	2,3
10	19		2,8	2,8
10	25		3,5	3,5
10	28		3,8	
12	25		5	
12	30		5,4	5,4
14	30		6,9	6,9
14	41		9,5	
16	30	7,7		7,7
18	35	13,6		
18	40	15,3		15,3
21	40	19,5		19,5
25	40	28		28
25	50	35		35
25	75	56		56

* Unit weight = typical values

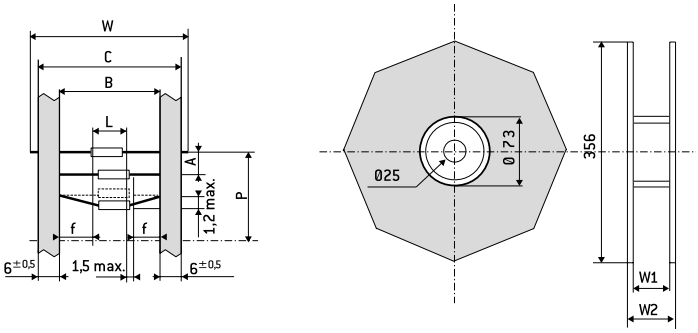
Possibles variations of = ± 25 % according to different voltage and capacitance.

General technical data

2. PACKAGING ON TAPE

2.1. Axial types

Dimensions and tolerance (in mm) in accordance with IEC 60 286-1



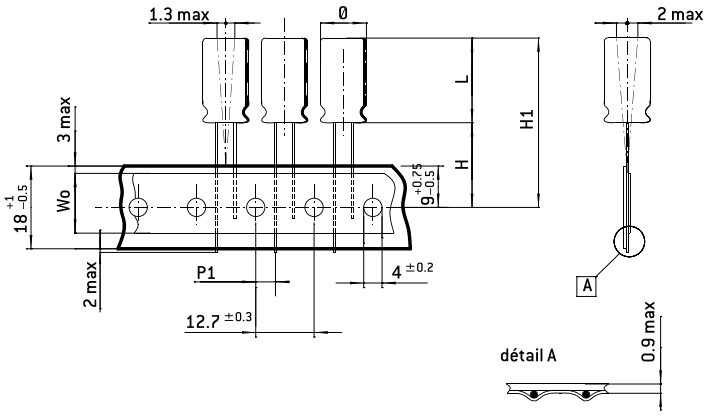
Dimensions									
D	L max.	B	A	P	C max.	W_1	W_2 max.	W	n [2]
6,5 8,5 [1]	20	7,3±1,5	10±1,5	± 2	87,5	93	106	85±1,5	1000 750
10 [1] 12 [1] 14 [1]	32	7,3±1,5	15±1,5	± 3	87,5	93	106	85±1,5	400 400 200

White positive tape ƒ: > 20 mm
P: 10 space

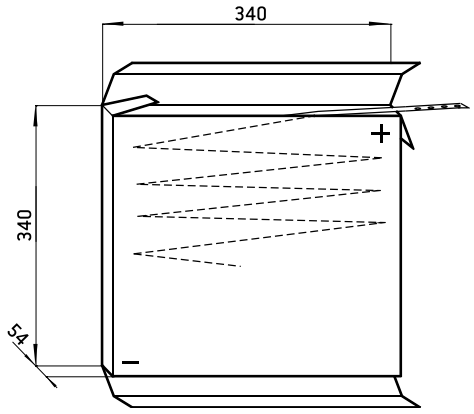
(1) On tape only on request
(2) n = number of capacitors per reel.

2.2. ALSIC IR - ALSIC 145

Dimensions and tolerance (in mm) in accordance with IEC 60 286-2.



Dimensions (mm)					
Ø	L	H_1 max.	W_0	P_1	H
10	16	46,5	13	3,85	19±1



Fan fold packaging (Ammopack)
Number of capacitors : 1000