ALUMINUM ELECTROLYTIC CAPACITORS
SPECIFICATION SHEET

Halogen Free

CUSTOMER PART No.		
Rubycon PART No.	CXW SERIES (Option code: HFA)	
DRAWING No.	REE – 115251	ISSUE No. 1
ISSUE DATE	16 April 2014	

RUBYCON CORPORATION
ENGINEERING DIVISION

1938-1, NISHIMINOWA, INA-SHI, NAGANO-KEN, JAPAN
TEL No. 0265-72-7116
FAX No. 0265-73-3380

DESIGN	YUICHI KOBAYASHI
CHECK	TETSUYA MIZU
APPROVAL	HIROKAZU KOUMURA

1.Scope.
This specification shall apply to CXW series, polarized aluminum electrolytic capacitors, which we deliver to you for use in electronic equipment.

2. Reference Standard
JIS C 5141 (1991) and JIS C 5102 (1986) methods for testing.

3. Operating Temperature Range
-25°C to +105°C

4. Performance Refer to Table-1

5. Style and Numbering System
(1) Style CE 04 (Radial Leaded)

(2) Numbering System

Rated Voltage	Series	Nominal Capacitance	Tolerance	Option	Lead Forming	Case size
□□□	CXW	□□□	M	HFA	RK	DXL

6. Marking
Unless otherwise specified, capacitor shall be clearly marked the following items on its body.
Sleeve color: Black
Lettering color: White

(1) Trade mark	Rubycon
(2) Rated Voltage	V
(3) Nominal Capacitance	μF
(4) Polarity	(Negative Polarity)
(5) Series	CXW
(6) Lot Number	
(7) Maximum Operating Temperature	105°C
(8) PET sleeve mark	PET

7. Vent
A safety vent shall be provided.

8. Halogen free Specification
All homogeneous materials within capacitor shall meet the criteria in the following table.
A homogeneous material has uniform composition throughout and cannot be mechanically disjointed into different materials.

<Criteria>

Substances	Permissible Limit (by weight)
Bromine (Br)	≤900 ppm
Chlorine (Cl)	≤900 ppm
Total concentration of Br+Cl	≤1500 ppm

9. The capacitors are treated to prevent recovery voltage.

10. Notes on use of aluminum electrolytic capacitors
(1) Charge and discharge
Do not use for the circuit that repeats quick charge or discharge.

(2) External stress
Do not apply excessive force of pushing, pulling bending, and/or twisting to the main body, lead wire and terminals.

(3) Heat resistance at soldering process
In the soldering process of PC board with Capacitors mounted, secondary shrinkage or crack of sleeve may be observed when soldering temperature is too high and /or soldering time is too long.
If lead wire of other components or pattern of double sided PC board touches the capacitor, the similar failure may be also originated at pre-heating, heating at hardening process of adhesive and soldering process.

(4) Insulation and PC board mounting
Sleeve is for marking purpose only.
It is not recognized as insulation materials.
When double sided PC board is employed, note that it could cause a short circuit if lead wire of other components or pattern of double sided PC board touches capacitor. Please avoid circuit pattern runs underneath capacitor.
In addition, case and cathode terminal are not insulated.

(5) Adhesives and coating materials
Do not use the adhesives and coating materials that contain halogenated organic solvents or chloroprene as polymer.

(6) Storage

Keep at a normal temperature and humidity. During a long storage time, leakage current will be increased. To prevent heat rise or any trouble that high leakage current possibly causes, voltage treatment is recommended for the capacitors that have been stored for a long time.

<Storage Condition>

*Aluminum electrolytic capacitors should not be stored in high temperatures or where there is a high level of humidity. The suitable storage condition is 5°C-35°C and less than 75% in relative humidity.

*Aluminum electrolytic capacitors should not be stored in damp conditions such as water, saltwater spray or oil spray.

*Do not store aluminum electrolytic capacitors in an environment full of hazardous gas (hydrogen sulfide, sulfurous acid gas, nitrous acid, chlorine gas, ammonia or bromine gas).

*Aluminum electrolytic capacitors should not be stored under exposure to ozone, ultraviolet rays or radiation.

(7) Fumigation and halogenated flame retardant

It may cause corrosion of internal electrodes, aluminum cases and terminal surface when the following conditions exist.

*Fumigation of wooden pallets before shipment to disinfect vermin.

*Existence of components or parts that contain halogenated flame retardant agent (bromine etc.) together with capacitors.

*When halogenated detergents of antiseptics for preventing infection of epidemic diseases contact directly to capacitors.

(8) PC board cleaning after soldering

Please consult us when cleaning is subjected.

♦Guide to application except the above are described in our catalog and EIAJ RCR-2367C.

EIAJ RCR-2367C: “Safety Application Guide for fixed aluminum electrolytic capacitors for use in electronic equipment."
Published by Japan Electronics and Information Technology Industries Association.

◆Table-1 PERFORMANCE

<table>
<tr><th colspan="2">ITEMS</th><th>PERFORMANCE</th></tr>
<tr><td>1</td><td>Rated Voltage(WV)
Surge Voltage (SV)</td><td>
<table>
<tr><td>WV(V.DC)</td><td>400</td><td>420</td><td>450</td></tr>
<tr><td>SV(V.DC)</td><td>450</td><td>470</td><td>500</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Nominal Capacitance
(Capacitance Tolerance)</td><td><Condition>
Measuring Frequency : 120Hz±20%
Measuring Voltage : Not more than 0.5Vrms + 1.5 to 2.0V.DC
Measuring Temperature : 20 ± 2 °C

<Criteria>
33 to 220μF(±20%)</td></tr>
<tr><td>3</td><td>Leakage Current</td><td><Condition>
The rated voltage shall be applied between terminals of capacitor such that the terminal voltage will reach the rated voltage within one minute and the leakage current shall be measured at 5 minutes after the voltage has reached the rated voltage across a 1000 ±10 Ω series protection resister. Then the current value shall not exceed value calculated from following formula.

<Criteria>
$I=3\sqrt{CV}$ Max.

where I : Leakage current in μA.
C : Nominal capacitance in μF.
V : Rated voltage in V.DC.</td></tr>
<tr><td>4</td><td>Dissipation Factor
(tanδ:Tangent of
loss angle)</td><td><Condition>
See ITEM 2, Nominal Capacitance, for measuring frequency, voltage and temperature.

<Criteria>
<table>
<tr><td>WV(V.DC)</td><td>400</td><td>420</td><td>450</td></tr>
<tr><td>tanδ</td><td>0.20</td><td>0.20</td><td>0.20</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Terminal Strength</td><td><Condition>
Tensile Strength of Terminals
The body of capacitor shall be fixed and the tensile force of following table shall be applied to the terminal in lead out direction of the terminal for 10±1 seconds.

Bending Strength of Terminals
The body of capacitor shall be held in such a way that the regular lead-out axis of lead wire terminal becomes vertical. The weight of following table shall be suspended from the end of terminal. In this condition, after the body of sample is bent through 90 degrees, it shall be returned to the original position. Next the body shall be reversibly bent through 90 degrees and again returned to the original position.
<table>
<tr><td>Diameter of lead wire</td><td>Tensile force
N{kgf}</td><td>Bending force
N{kgf}</td></tr>
<tr><td>Over 0.5mm to 0.8mm incl</td><td>10{1.0}</td><td>5 {0.51}</td></tr>
</table>

<Criteria>
Notable changes shall not be found, as breakage or looseness in the terminal.</td></tr>
</table>

6 Temperature Coefficient and Drift

<Condition>

STEP	Testing Temperature (°C)	Time
1	20±2	Time to reach thermal equilibrium
2	-25±3	//
3	20±2	//
4	105±2	2 hrs.
5	20±2	Time to reach thermal equilibrium

Capacitance, D.F. and Impedance shall be measured at 120Hz.

<Criteria>

STEP 2	Impedance Ratio	The value of ratio to STEP 1 not more than value of following table.
STEP 4	Capacitance Change	Within ±20% of the value of STEP 1
	Dissipation Factor	Not more than the specified value
	Leakage Current	Not more than 8 times the specified value
STEP 5	Capacitance Change	Within ±10% of the value of STEP 1
	Dissipation Factor	Not more than the specified value
	Leakage Current	Not more than the specified value

WV(V.DC)	400	420	450
Z(-25°C)/Z(+20°C)	8	8	8

7 Load Life Test

<Condition>

Capacitor under the test shall be applied the rated voltage continuously through 1000 ohm series protective resistor (with maximum ripple current) at 105±2°C for 5000^{+72}_{0} hours. After the test and returned in standard condition for 2 hours or more, and the capacitor shall meet following requirements.

<Criteria>

Leakage Current	Not more than the specified value
Capacitance Change	Within ±20% of the initial value
Dissipation Factor	Not more than 200% of the specified value
Appearance	Notable changes shall not be found, except sleeve

8 Shelf Life Test

<Condition>

Capacitors shall be stored at 105±2°C with no voltage applied for 500^{+24}_{0} hours. After the test and returned in standard condition for 1 to 2 hours and the capacitor shall meet following requirements. (If any doubt arises on the judgment, the capacitors shall be subjected to voltage treatment specified in JIS C 5141,5.2.)

<Criteria>

Leakage Current	Not more than the specified value
Capacitance Change	Within ±20% of the initial value
Dissipation Factor	Not more than 200% of the specified value
Appearance	Notable changes shall not be found

9 Surge Voltage

<Condition>
Capacitor shall be applied the surge voltage through a (100±50)/C_R [kΩ] resistor in series for 30±5 seconds in every 6±0.5 minutes at 15 to 35°C. Procedure shall be repeated 1000 times. Then the capacitors shall be left under normal humidity for 1 to 2 hours before measurement.
[C_R : Nominal Capacitance (μF)]

<Criteria>

Leakage Current	Not more than the specified value
Capacitance Change	Within ±15% of the initial value
Dissipation Factor	Not more than the specified value
Appearance	Notable changes shall not be found

◊This test simulates over voltage at abnormal situations, and not be hypothesizing that over voltage is always applied.

10 Vibration Test

<Condition>
Testing shall be done out in 3 AXIS for 2 hours each (total 6 hours) as below.
Fix lead wire at a point not more than 4mm from the body , use mounting device separately for the one with a diameter 12.5mm and greater or with a length 25mm and longer.

Vibration frequency range : 10 to 55Hz
Peak to peak amplitude : 1.5mm
Sweep rate : 10 to 55 to 10Hz, In about 1min.

<Criteria>

Capacitance (During test)	Measured value shall be stable. (The time from one end to the other of the vibration frequency within last 30 minutes at last direction.)
Capacitance Change	Within ±5% of the initial value
Appearance	Notable changes shall not be found

11 Solderability

<Condition>
Terminals of the capacitor shall be immersed in flux (ethanol solution of the rosin, 25 wt% rosin) for 5 to 10 seconds and shall be immersed in the solder bath (235±5°C) and held for 2±0.5 seconds, and pulled out at the same speed.

<Criteria>
At least 3/4 of circumferential surface of dipped portion of the terminal shall be covered with new solder.

12 Resistance to Solder Heat

<Condition>
Terminals of the capacitor shall be immersed into solder bath at 260±5°C for 10±1 seconds up to 1.5 to 2.0mm from the body of capacitor.
Then the capacitors shall be left under the normal temperature and normal humidity for 1 to 2 hours before measurement.

<Criteria>

Leakage Current	Not more than the specified value
Capacitance Change	Within ±10% of the initial value
Dissipation Factor	Not more than the specified value
Appearance	Notable changes shall not be found

13 Resistance to Damp Heat (Steady State)

<Condition>
Capacitor shall be stored in the ambient of 40±2°C and relative humidity 90 to 95% for 240±8 hours.
Then the capacitors shall be left under the normal temperature and normal humidity for 1 to 2 hours before measurement.

<Criteria>

Leakage Current	Not more than the specified value
Capacitance Change	Within ±10% of the initial value
Dissipation Factor	Not more than the specified value
Appearance	Notable changes shall not be found

14	Maximum Permissible Ripple Current	(1)The maximum permissible ripple current is the maximum A.C. current at 120Hz and can be applied at maximum operating temperature. (2)The combined value of D.C. voltage and the peak A.C. voltage shall not exceed the rated voltage and shall not be reverse voltage.

<Frequency Coefficient>

Frequency (Hz)	60(50)	120	500	1k	10k≤
Coefficient	0.80	1.00	1.25	1.40	1.50

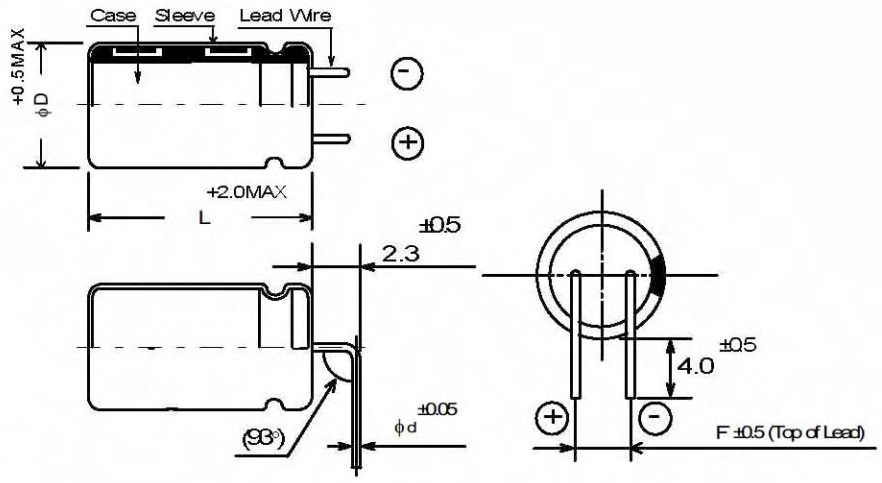
< Temperature Coefficient >

Ambient Temperature(°C)	105	85	65≥
Coefficient	1.0	1.7	2.1

◊Temperature coefficient shows a limit of ripple current exceeding the rated ripple current that can be passed through a capacitor at each temperature when the life expectancy of a capacitor becomes to be nearly equal with the lifetime at the rated maximum operating temperature.

◊Use of aluminum electrolytic capacitor under ripple voltage with wide amplitude is equivalent to quick charge-discharge operation.
When ripple voltage with the amplitude over 70Vp-p is expected for the products with rated voltage over 100V, please contact us.

9. Diagram of dimensions. :unit mm
Lead Forming : RK



φD	10	12.5	14.5	16	18
φd	0.6		0.8		
F	5.0		7.5		

Sleeve	P.E.T.
Case	Aluminum
Lead Wire	Tin plated

◆Table2 Standard size, Maximum permissible ripple current

Rated voltage 400V		
Nominal capacitance (μF)	Size φDxL(mm)	Ripple Current (A r.m.s./105°C,120Hz)
39	10X40	0.37
47	10X45	0.42
56	10X50	0.47
68	12.5X40	0.54
82	12.5X45	0.61
82	14.5X31.5	0.57
100	12.5X50	0.68
100	14.5X40	0.69
100	16X31.5	0.71
120	14.5X45	0.79
120	16X35	0.80
150	16X40	0.92
150	18X31.5	0.89
150	18X40	1.05
180	16X50	1.08
180	18X40	1.06
220	18X45	1.20

Rated voltage 420V		
Nominal capacitance (μF)	Size φDxL(mm)	Ripple Current (A r.m.s./105°C,120Hz)
39	10X40	0.36
47	10X50	0.43
56	12.5X40	0.48
68	12.5X40	0.52
68	14.5X31.5	0.52
82	12.5X45	0.59
82	14.5X35	0.59
100	14.5X40	0.67
100	16X31.5	0.69
120	14.5X45	0.75
120	16X35	0.78
120	18X31.5	0.80
150	16X45	0.94
150	18X35	0.92
180	16X50	1.05
180	18X40	1.04
220	18X50	1.22

Rated voltage 450V		
Nominal capacitance (μF)	Size φDxL(mm)	Ripple Current (A r.m.s./105°C,120Hz)
33	10X40	0.34
39	10X45	0.38
47	12.5X40	0.44
56	12.5X40	0.49
68	12.5X45	0.55
68	14.5X31.5	0.52
82	12.5X50	0.62
82	14.5X40	0.63
82	16X31.5	0.64
100	14.5X45	0.71
100	16X35	0.73
120	14.5X50	0.79
120	16X40	0.82
120	18X31.5	0.80
150	16X50	0.98
150	18X40	0.97
180	18X45	1.09
220	18X50	1.22