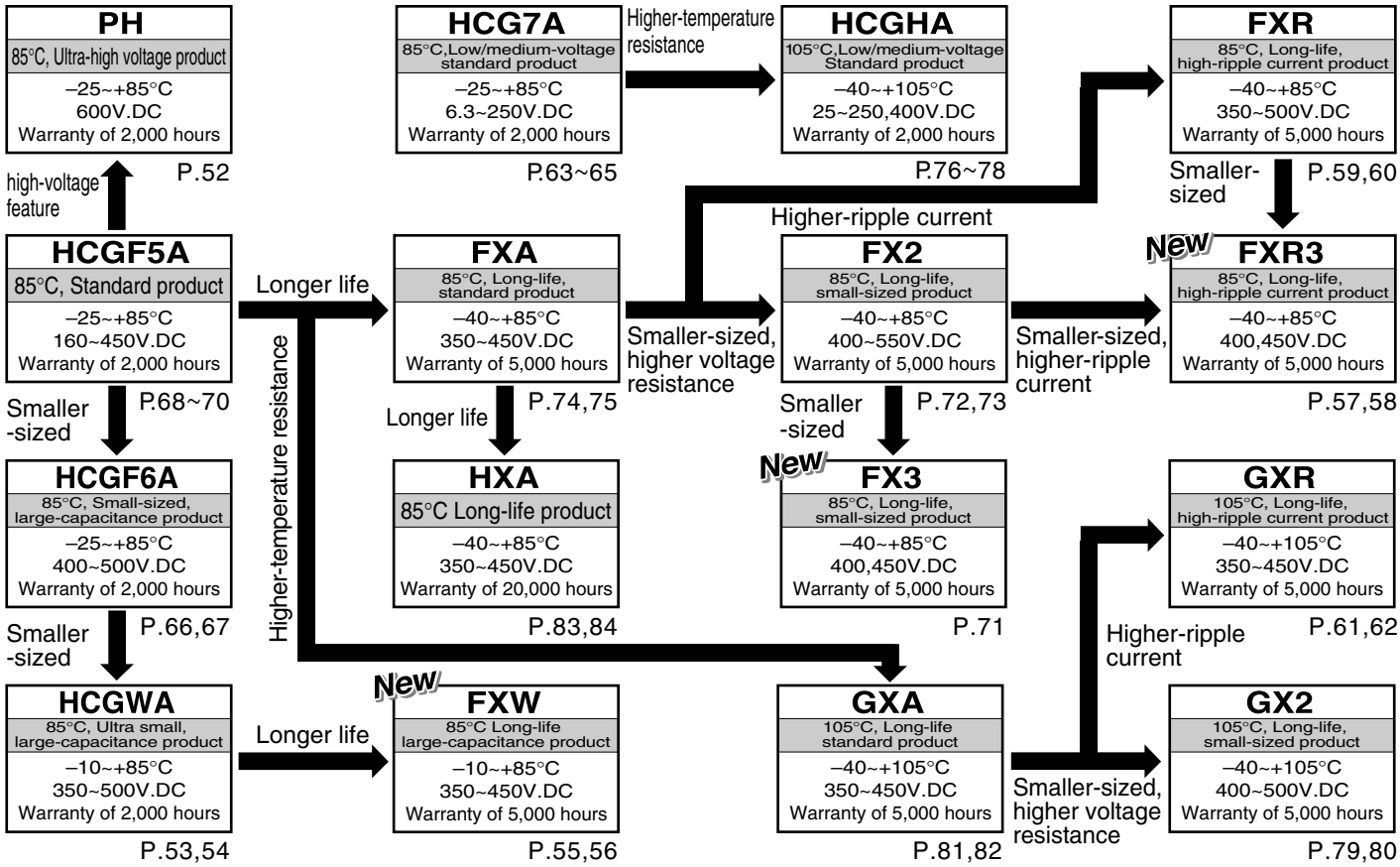
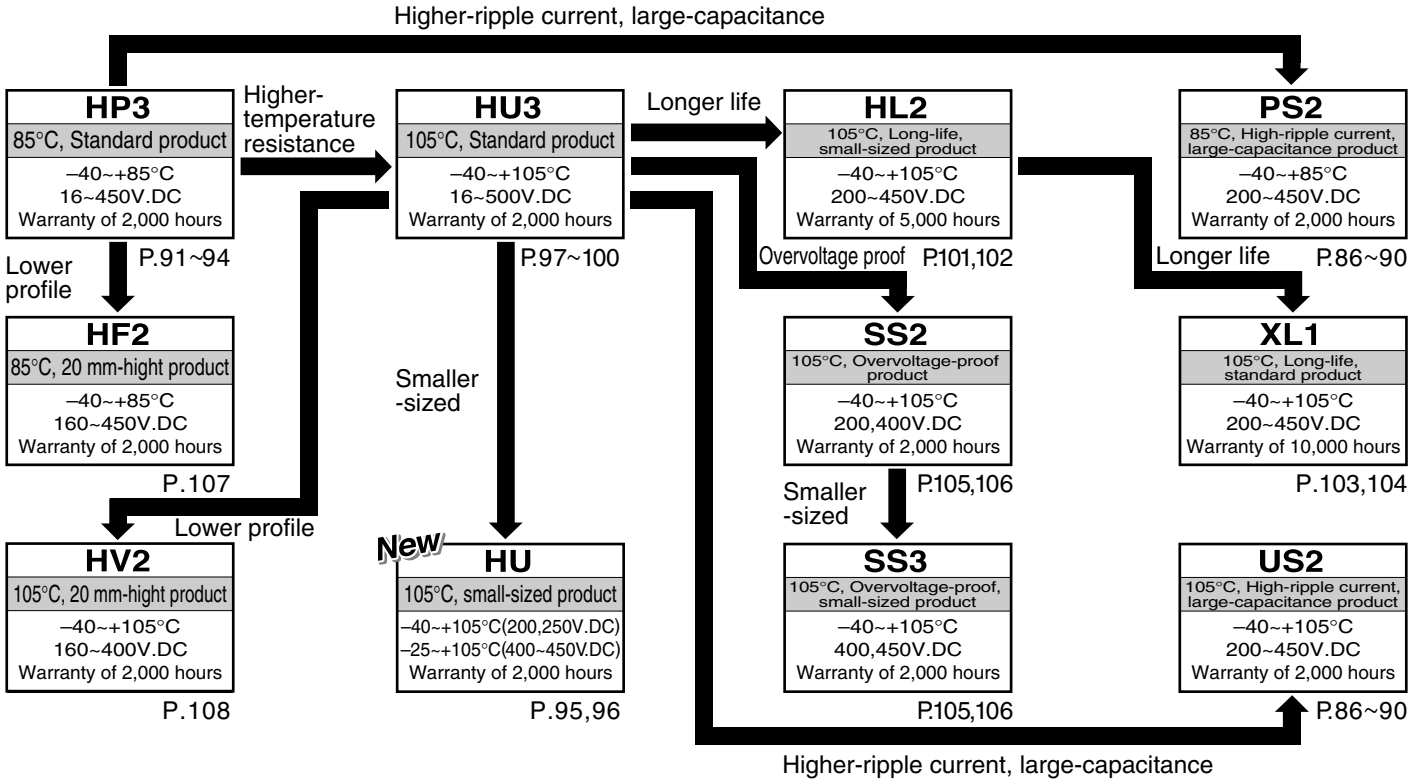
All series Conform RoHS

Product Line Chart

Screw terminal type



Snap Mount type



Product Table

Screw terminal type Aluminum Electrolytic Capacitors

Series	Features	Warranty Life time [h]	Useful Life time [h]	Operating Temperature range	Standard product	Small-sized product	High-reliability product	Low profile product	Operating voltage V.DC	Capacitance range μF	Page
PH	**Ultra-high voltage product**	2,000	4,000	–25~ +85°C	○				600	1200~4700	52
HCGWA	**Ultra small, large-capacitance product**	2,000	4,000	–10~ +85°C		○			350~500	5600~39000	53
FXW	**Long-life, large-capacitance product** New	5,000	8,000	–10~ +85°C		○	○		350~450	9000~38000	55
FXR3	**Long-life, high-ripple current product** New	5,000	8,000	–40~ +85°C		○	○		400,450	3900~22000	57
FXR	**Long-life, high-ripple current product**	5,000	8,000	–40~ +85°C			○		350~500	1500~12000	59
GXR	**Long-life, high-ripple current product**	5,000	8,000	–40~ +105°C			○		350~450	1800~10000	61
HCG7A	**Low/medium-voltage standard product**	2,000	4,000	–25~ +85°C	○				6.3~250	1000~680000	63
HCGF6A	**Small-sized, large-capacitance product**	2,000	4,000	–25~ +85°C		○			400~500	1200~22000	66
HCGF5A	**Standard product**	2,000	4,000	–25~ +85°C	○				160~450	270~39000	68
FX3	**Long-life, small-sized product** New	5,000	8,000	–40~ +85°C		○	○		400,450	2200~8200	71
FX2	**Long-life, small-sized product**	5,000	8,000	–40~ +85°C		○	○		400~550	1000~22000	72
FXA	**Long-life, standard product**	5,000	8,000	–40~ +85°C	○		○		350~450	1000~18000	74
HCGHA	**105°C, Standard product**	2,000	4,000	–40~ +105°C	○		○		25~400	330~330000	76
GX2	**Long-life, small-sized product**	5,000	8,000	–40~ +105°C		○	○		400~500	1000~10000	79
GXA	**Long-life standard product**	5,000	8,000	–40~ +105°C	○		○		350~450	1000~15000	81
HXA	**Long-life product**	20,000	20,000	–40~ +85°C	○		○		350~450	1000~15000	83

Snap Mount Type Aluminum Electrolytic Capacitors

Series	Features	Warranty Life time [h]	Useful Life time [h]	Operating Temperature range	Standard product	Small-sized product	High-reliability product	Low profile product	Operating voltage V.DC	Capacitance range μF	Page
PS2	**High-ripple current, large-capacitance product**	2,000	4,000	–40 ~ +85°C		○	○		200~450	390~4700	86
US2	**High-ripple current, large-capacitance product**	2,000	4,000	–40 ~ +105°C		○	○		200~450	330~4700	86
HP3	**Standard product**	2,000	4,000	–40 ~ +85°C	○				16~450	82~33000	91
HU	**Small-sized product** New	2,000	4,000	–40~+105°C(※1) –25~+105°C(※2)		○			※1 200, 250 ※2 400~450	100~2200	95
HU3	**Standard product**	2,000	4,000	–40 ~ +105°C	○				16~500	39~33000	97
HL2	**Long-life, small-sized product**	5,000	8,000	–40 ~ +105°C		○	○		200~450	47~1500	101
XL1	**Long-life, standard product**	10,000	15,000	–40 ~ +105°C	○		○		200~450	39~1500	103
SS3	**Overvoltage-proof, small-sized product**	2,000	4,000	–40 ~ +105°C		○	○		400, 450	39~470	105
SS2	**Overvoltage-proof product**	2,000	4,000	–40 ~ +105°C			○		200, 400	68~1500	105
HF2	**Low profile product**	2,000	4,000	–40 ~ +85°C				○	160~450	33~470	107
HV2	**Low profile product**	2,000	4,000	–40 ~ +105°C				○	160~400	33~470	108

Though it is not mentioned in this table, warranty of 3,000 hours at 85°C and warranty of 3,000 hours at 105°C are produced.

SR7	**Photo flash use, lead wire, radial type small-sized product**	—	—	–20 ~ +55°C		○			330	80~300	109
HD6	**Photo flash use, lug terminal type, small-sized product**	—	—	–20 ~ +55°C		○			330,360	150~1500	109

NOTES TO USERS OF ALUMINUM ELECTROLYTIC CAPACITORS

Aluminum electrolytic capacitors ('capacitors') may cause explosion, fire, or other serious hazard if used outside the specified operating conditions. Please familiarize yourself with the instructions below before using these capacitors.

Item	Instructions	
Operating temperature, ripple current	1.	Check the operating and installation environment and use the capacitor within the range of the rated performance specified in the catalog or specifications.
	2.	Maintain operating temperature and ripple current within the specified ranges. Base your choice of capacitors on the maximum load conditions. A capacitor will overheat under excessive current, potentially resulting in short circuit, fire, or other major failure.
	3.	A capacitor also generates the self heating. Please bear in mind that the capacitor heats up the interior of the equipment, and take appropriate precautions. Operate the unit under normal conditions and check the temperature of the area surrounding the capacitor.
	4.	The permissible ripple current declines with the rise in ambient temperature (the temperature of the capacitor's surroundings). Consider the permissible ripple current at the maximum predictable ambient temperature.
	5.	Electric characteristics change as frequencies change. Check frequency changes in order to choose the right capacitor. Special attention needs to be given to the self heating and short life time both low and high frequency, when equivalent series resistance and inductance change.
Applied voltage and other operating conditions	1.	In general, capacitors have polarity. Applying reverse voltage or AC voltage to a capacitor may activate the vent or cause a short circuit, fire or other major failure. Use a special AC capacitor for AC voltage.
	2.	Use a bipolar capacitor for circuits whose polarity reverses. However, as in any other case, do not use a bipolar capacitor in an AC circuit.
	3.	Do not apply voltage in excess of the rated voltage. When an AC voltage is superimposed on DC voltage, prevent the peak value from exceeding the rated voltage. Excessive voltage may cause a short circuit, fire, or other major failure.
	4.	Specifications on surge voltage have restricted conditions and therefore do not guarantee long hours of operation. Voltage should never exceed the rated voltage of the capacitor, even for brief periods. Choose your capacitor accordingly.
	5.	When connecting more than one capacitor in parallel, give proper consideration to the resistance of the wiring. Establish the connections so that the wiring resistance will be equal at every capacitor.
	6.	When connecting more than one capacitor in series, all must be of identical rating, then the balancing resistors connected in parallel. At that time, design the circuit so that equal voltage levels are applied to all the capacitors. Ascertain that the voltage applied to each individual capacitor does not exceed its rated voltage.
	7.	Take into account the service life of the equipment in the use of the capacitor. Use of the capacitor beyond its service life risks such failures as safety vent activation or short circuit. Replace as necessary at regular inspection.
	8.	Do not use a capacitor for a circuit that is quickly charged and discharged repeatedly. Use a dedicated capacitor for an application like a welding unit or photo flash charging/discharging. Consult us for selecting the proper capacitor, since the control circuits of certain rotation equipment, like servo motors, charge and discharge repeatedly.
	9.	Even slow charging/discharging can shorten the service life of a capacitor, resulting in premature failure, where there are marked changes in voltage changes. Check the installation in your equipment carefully and consult us.
	10.	General purpose capacitors should not be used for a circuit involving rapid charge and discharge or an A.C. circuit. Capacitors specially made for such applications should be used. →Check the self heating of the capacitor used in such a circuit in addition to the types and levels to be imposed to the capacitor of the rapid charge/discharge, rush current and voltage.
Before installation	1.	Check the specifications of the capacitors, and install them within the prescribed specifications.
	2.	Do not reverse the polarity. Do not use a capacitor where reverse voltage is applied, even if it appears problem-free. Not taking these precautions could lead to a major failure.
	3.	Dropping or otherwise impacting a capacitor may result in a decline in its electric performance, causing a failure. Do not use any capacitor whose packaging has a noticeable abnormality on delivery.
	4.	Do not distort the shape of the capacitor, which may lead the major failures such as liquid leakage or short circuit.
	5.	Do not reuse a capacitor that has previously been installed on a machine and energized. No capacitor can be reused (with the exception of removal for measuring electrical performance during periodic checkups).
Installation	1.	Do not install wiring or a circuit pattern near the vent. When the vent is activated, electrolyte may spurt out, resulting in short circuit followed by fire or other secondary hazard due to tracking or migration.
	2.	Do not lay out heat-generating components near the capacitor. Radiated heat and other partially high temperatures may shorten the life of the capacitor. PCB temperature that is higher than the internal temperature of the capacitor markedly hinders the dissipation of heat inside the capacitor, greatly shortening its life. When designing equipment, check temperature distribution first.

Item		Instructions
Installation	3.	Do not hinder the activation of the vent. Allow for the following clearance above the vent. If dissipation of gas is inhibited while the the vent is in operation, the inner pressure will rise, with danger of explosion, fire or other major failure. Capacitor diameter / Clearance ϕ 18~35(36) / 3mm or more ϕ 40 or more / 5mm or more
On-board self-supporting (snap mount type) capacitors	1.	Do not connect the blank terminal (reinforced terminal) of multi-terminal (3-, 4-) snap mount capacitors, as this could cause a short circuit.
	2.	Use a completely isolated circuit between the case and the electrode terminal, and between the case and the circuit pattern.
	3.	Exterior sleeves are for labeling purposes, not for insulation. Consult us if you need insulation.
	4.	Failure to tightly solder the capacitor to the PCB may result in one of its terminals breaking or its pattern peeling off due to vibration. Insert the capacitor snugly and correctly into the designated holes in the PCB, then solder it.
	5.	Terminal pitch and dimensions for the terminals are specified for a capacitor.→ Check whether the terminal pitch and the mounting holes on the board match properly. The electrolyte leaks from inside if mismatched.
	6.	If it becomes necessary to process a lead wire terminal due to mismatching of the space between the terminals to the holes in the PCB, be sure to melt the solder thoroughly so the capacitor isn't subjected to stress.
	7.	Flux on the rubber seal may result in corrosion. Do not let flux stick to any part other than the terminals.
	8.	Solder at 260°C for not more than 10 seconds or at 350°C for not more than 3 seconds. Exceeding these specifications may result in a decline in electrical performance, leading to trouble. Do not let the tip of the soldering iron come in contact with the capacitor body.
	9.	If it becomes necessary to remove a capacitor after soldering, melt the solder with a soldering iron to avoid subjecting the terminals to stress.
	10.	For cleaning flux, we recommend an aqueous or higher alcohol detergent or isopropyl alcohol. The recommended concentration of flux with regard to the cleaning agent is 2wt% or less. Excessively high flux concentration may cause corrosion due to halide. For use of other cleaning agents, consult us.
	11.	If you must clean the capacitor with halogen solvents, etc., we recommend that you use washable capacitors. Make sure that the cleaning conditions are within those stipulated in the specifications, and measure the cleaning agent for conductivity, pH, specific gravity and moisture content for contamination control. After cleaning, thoroughly dry the capacitors together with PCBs. Do not store the capacitors in the same atmosphere as the cleaning agent or in a sealed container. For details on washable capacitors, consult us.
	12.	11. Some cutting oils contribute to swelling of rubber, with the risk of corrosion and a decline in air-tightness. If the rubber surface will be exposed to cutting oils, use washable capacitors as in 10 above.
	13.	Thoroughly remove all traces of the cleaning agent from the capacitor. Even when not cleaning the flux, dry the flux itself. Cleaning agent or flux residue may cause the halide to penetrate the rubber seal, leading to corrosion.
	14.	When fixing a PCB and capacitor with a coating agent or fixative, use a substance completely free of halide compounds. Thoroughly dry the flux or detergent before applying the coating. Do not let the coating block the entire surface of the seal. Any halide compound present in the coating may lead to corrosion.
	15.	When installing the vent of the capacitor against the PCB, drill a gas bleeder hole to allow the gas to escape when the vent is activated. If the diffusion of gas is hindered while the vent is in operation, the internal pressure can rise, with danger of explosion, fire or other serious failure.
	16.	Do not twist or otherwise physically move the capacitor after soldering it to the PCB. Do not take hold of the capacitor to move a PCB either, as this may deform the terminal or decrease its air tightness.
	17.	Do not apply physical impact to the capacitor (striking, etc.) after it is soldered to a PCB. When stacking PCBs, make sure that the capacitors don't contact PCBs or other components.
	18.	Do not solder a capacitor by dipping in a solder bath. Solder only on the terminal side of the capacitor, via a PCB.

<table>
<tr><th>Item</th><th colspan="2">Instructions</th></tr>
<tr><td>Installation

Screw-terminal type capacitors</td><td>1.</td><td>When the capacitor must be installed on its side, the anode terminal side must face upward. If the anode terminal is located below the cathode terminal, internal corrosion may occur during long-time use.</td></tr>
<tr><td></td><td>2.</td><td>The vent (cap face) should not face downward. Electrolytic solution and compounds (element fixing agents) could leak from the valve.</td></tr>
<tr><td></td><td>3.</td><td>Recommended tightening torque and terminal permissible current (maximum current a terminal can withstand) for each terminal screw are listed below. Consult us if you wish to use a capacitor on a machine that vibrates significantly.
<table>
<tr><th>Terminal</th><th>Recommended torque (permissible level) [N·m]</th><th>Terminal permissible current [A]</th></tr>
<tr><td>M5</td><td>2.2(1.5~3.0)</td><td>60</td></tr>
<tr><td>M6</td><td>3.5(3.0~4.0)</td><td>100</td></tr>
<tr><td>M8</td><td>7.5(7.0~8.0)</td><td>120</td></tr>
</table></td></tr>
<tr><td></td><td>4.</td><td>The terminal screws (M5 standard underhead: 10mm, M6 standard underhead: 12mm) in the separate package are designed for wire thickness not exceeding 2mm. Add to the screw length for wires more than 2mm thick. Heat generated due to a small screw clamping area could cause a failure.</td></tr>
<tr><td></td><td>5.</td><td>If a screw is loose or angled, that portion generates heat, with a danger of fire or other serious failure. Check that the screw is inserted on the perpendicular and securely tightened.</td></tr>
<tr><td></td><td>6.</td><td>We recommend a bar hole diameter of 6mm for M5 terminals. An excessively large hole diameter may result in poor contact between the terminal surface and the bar, causing local heat buildup, with a danger of fire or other serious failure.</td></tr>
<tr><td></td><td>7.</td><td>Do not apply physical stress (tightening with fixtures, etc.) to the curled portion (seal contacting the case and cap). Any such practice may cause a liquid leak or sleeve breakage.</td></tr>
<tr><td>Operating environment</td><td>1.</td><td>Water, saltwater, oil or other electrically conductive liquid on a capacitor, or using a capacitor when it is damp with dew may cause a failure. Oil on the rubber seal or safety vent may cause a decline in airtightness. Do not use any capacitor in contact with liquid. Do not use capacitors that have been immersed in rainwater or other contaminated water.</td></tr>
<tr><td></td><td>2.</td><td>Do not use or leave a capacitor in areas where there is halide compound gas such as hydrogen sulfide, nitrous acid, sulfurous acid, chlorine and bromine, or ammonia or other hazardous gas. The ingress of any of these gases into a capacitor may corrode it.</td></tr>
<tr><td></td><td>3.</td><td>Do not use or leave a capacitor in an area exposed to ozone, ultraviolet light, or radiation.</td></tr>
<tr><td></td><td>4.</td><td>Powders (dust, etc.) that settle between terminals can absorb moisture and cause corrosion and tracking of the terminal. When there is conspicuous dust between terminals, stop the current, allow the capacitor to discharge, and wipe the terminals with paper or a towel lightly dampened with water or ethanol. Do not use cleaning agents or other chemicals.</td></tr>
<tr><td></td><td>5.</td><td>Do not use a capacitor in an area subject to excessive vibration or impact.</td></tr>
<tr><td>Storage</td><td>1.</td><td>Store all capacitors indoors at a temperature of 5-35°Cand relative humidity of not more than 75%RH (25°C), away from direct sunlight. The maximum shelf life of capacitors is 3 years. All capacitors which have been on the shelf for more than 3 years have an excessively high leakage current. Treat them with appropriate voltage before use. The maximum shelf life of capacitors for photo flash use is 1 year, and 2 years for snap mount capacitors using leadless soldered terminals, beyond which solderability deteriorates.</td></tr>
<tr><td></td><td>2.</td><td>Store capacitors under the same operating conditions as mentioned above, with the exception of temperature and humidity.</td></tr>
<tr><td></td><td>3.</td><td>Store capacitors in their original packaging whenever possible.</td></tr>
<tr><td></td><td>4.</td><td>Even after discharged, capacitors may hold an electrical charge due to re-striking. Do not touch the terminals with bare hands. Touching the terminals could cause an electric shock. Discharge all capacitors with a resistor (approx. 1kΩ) or a discharge plate before use.</td></tr>
<tr><td>Test run</td><td>1.</td><td>Do not touch the terminals of a capacitor with bare hands. Touching the terminals could cause an electric shock.</td></tr>
<tr><td></td><td>2.</td><td>Do not short-circuit a capacitor between its terminals with an electrically conductive material.</td></tr>
<tr><td></td><td>3.</td><td>Do not apply any acid, alkaline, or other electrically conductive solution to a capacitor.</td></tr>
<tr><td></td><td>4.</td><td>Check the "Design Operating Conditions" for the operating conditions for capacitors</td></tr>
<tr><td>Maintenance and servicing</td><td>1.</td><td>Conduct periodic checkups on capacitors for industrial equipment, following these checkpoints:
(1) Appearance: Condition of the vent (open, notably swollen), liquid leaks or other considerable abnormality
(2) Electrical performance: Capacity, tangent of loss angle, leakage current, and other items specified in the delivery specifications.
The standard temperature for measuring electrical performance is 20°C. Leave the capacitor at 20°C and wait for the inside of the capacitor to reach the specified temperature before taking measurements. Consult us on whether to use such a capacitor. Before each periodic checkup, turn off the equipment and completely discharge the capacitor.</td></tr>
<tr><td></td><td>2.</td><td>Replace all capacitors whose service life has reached its end. When replacing one capacitor, always replace all of them. Mixing old and new capacitors may cause an imbalance in the ripple current or voltage sharing, risking failures such as activation of the vent or short circuit.</td></tr>
</table>

Item	Instructions	
In an emergency	1.	If gas is detected while a product is in use, turn off the main power supply or unplug it.
	2.	When the safety vent of a capacitor is activated, a hot gas exceeding 100°C will escape. Do not place your face in close proximity to the vent and avoid proximity to areas exposed to the gas.
	3.	Should the gas jet get in your eyes, wash them immediately with clean water. If you inhale the gas, gargle immediately. The gas is composed of a gaseous form of hydrogen or organic solvents.
	4.	Should the electrolyte come in contact with your skin, wash with soap and water. Never put it into your mouth.
For scrapping	1.	Scrapped capacitors are classified as scrapped metal. For burial they are handled as controllable industrial waste because of the nature of the contents (electrolyte). Commission an industrial waste disposal specialist for their disposal. Ensure that no waste products enter the market.
	2.	Most of the material is aluminum and cannot be completely burned. In incineration, take the following into consideration:
		- Burning the capacitors in an airtight state may cause an explosion. Before incinerating, either pierce the exterior or break them open. Be sure to wear protective clothing during this operation, since electrolyte or gas will jet out if the inner pressure of the capacitor is high.
		- Because of the exterior material (polyvinyl chloride), low-temperature incineration may emit hazardous gases. Burn the material at high temperatures (800°C or above). Incineration requires separation of the exterior materials.
	3.	Do not attempt to crush the capacitors, as this may cause electric shock or injury.
Miscellaneous	1.	For details, see the Guidelines on the Operation of Fixed Aluminum Electrolytic Capacitors for Electronic Equipment EIAJ RCR-2367B March, 2002 issue.
	2.	To preserve the global environment, we are expediting the substitution of chemical substances that negatively impact the environment. We ask your cooperation in our initiative to reduce substances with environmental impact. We also ask you to avoid using ozone-layer destroying substances to clean capacitors.
	3.	To control insects during export, fumigation may be done using halide compounds such as methyl bromide. Direct fumigation of capacitors or equipment incorporating capacitors or use of fumigated timber as a pallet may cause corrosion inside a capacitor, resulting in failure. Even when covered in plastic, chemicals may penetrate through small gaps. Likewise, do not apply insecticides directly on or near the capacitors.
	4.	When using a sterilizer against SARS and other infectious diseases, do not spray it directly on or close to capacitors and equipment incorporating capacitors. Some sterilizers contain a high concentration of halide compounds. The sterilizer spray may accelerate internal corrosion, resulting in failure. Avoid using capacitors or equipment incorporating capacitors onto which a chemical has been sprayed. Instead, replace them with new ones.
	5.	Consult us for further information.

Service Life of an Aluminum Electrolytic Capacitor

[Factors affecting service life]

Environmental factors affecting the service life of an aluminum electrolytic capacitor include temperature, humidity and vibration (environment), as well as electrical factors, applied voltage, ripple current and charging/discharging conditions. In capacitors for mid-to-high-voltage filters, temperature and applied voltage are the most important controlling factors. The estimated service life may be calculated based on the core temperature of the capacitor and the applied voltage.

[Temperature conditions]

Capacitance change or tangent change for loss angle indicates that the product life has been affected by temperature. Generally, as the ambient temperature (neighboring temperature of the capacitor) increases, capacitance decreases and tangent change for loss angle takes place more rapidly. This is mainly because electrolytic solution generates gas due to electrode reaction and diffuses it outside via a sealing rubber. The following expression (1) indicates the relation between the ambient temperature and electric characteristic that changes with time (while the capacitor is used normally according to the rules of serviceability).

$$L = L_0 \times 2^{\frac{T_0 - T}{10}} \cdots\cdots (1)$$

Where,

L : Estimated service life in actual use

L_0 : Standard service life when allowable ripple current load or rated voltage is applied at the maximum operating temperature

T_0 : Maximum core temperature setting when subjected to the maximum allowable ripple load at the maximum operating temperature (settings differ in different series or products. Contact us for details)

T : Core temperature of the capacitor during actual use

Therefore, the lower the core temperature of the capacitor during actual use, the longer the estimated service life is. The core temperature of a capacitor may be lowered by lowering either the ambient temperature or the load current (operating conditions), or by either boosting capacitance or lowering internal resistance. Some capacitors feature a radiating structure to lower the core temperature. Consult us for the selection of capacitors.

When multiple capacitors are connected in parallel, check the core temperature in each capacitors and the balance of the total series resistance to each capacitors. If capacitors are used at high frequency, the circuit resisitance is especially need to considered. The estimating service life is needed to caluculated from the maximum core temperature.

[Voltage conditions]

The service life of an aluminum electrolytic capacitor for mid- to high-voltage filters is affected by the applied voltage. If the applied voltage is between 60% and 100% of the rated voltage, the estimated service can be extended by lowering the applied voltage below the rated voltage. However, if the applied voltage is less than 60% of the rated voltage or the capacitor is used in low-pressure (100 WV or less) applications, the impact of the applied voltage on the service life is negligible. Therefore, service life is estimated assuming no impact from voltage. Continuous application of a voltage over the rated voltage rapidly increases leakage current in a capacitor. This may increase internal pressure due to generation of gases, resulting in activation of the safety vent in a short time and/or formation of an internal short circuit. For this reason, the applied voltage must be maintained below the rated voltage during use. Besides, it should be noted that the circuit design is such that the applied voltage will remain 80% or less of the rated voltage during use.

Where more than one capacitor connected in series is used, the applied voltages across the individual capacitors may become out of balance, resulting in the application of excessive voltage to them. To avoid this, either choose a rated voltage allowing for voltage imbalances, or connect a voltage divider (resistors) to the capacitors.Please be careful about charge/discharge.

[Formula for estimating service life]

1. Estimating from the core temperature of the capacitor and applied voltage

Formula for calculating the service life of our capacitors in mid-to-high voltage applications (filters).

$$L = L_0 \times 2^{\frac{T_0 - T}{10}} \times \left(\frac{WV}{V} \right)^{2.5} \qquad (2)$$

Where,

T_0 : Maximum core temperature setting when subjected to the maximum allowable ripple load at the maximum operating temperature

L_0 : Standard service life when core temperature is T_0 and rated voltage is (WV)

L : Estimated service life when core temperature is T and applied voltage is (V)

If V/WV<0.6, use V/WV = 0.6.

2. Estimating core temperature of a capacitor from load ripple current

We recommend that you estimate service life by measuring the core temperature of the capacitor with a thermocouple. We can manufacture samples with inserted thermocouples according to customer requests. If for some reason it is impossible to measure the core temperature, you can estimate the service life by making a rough estimate of the core temperature of the capacitor from the load ripple current. As shown below, assuming the rise in temperature and the square of load current to be nearly proportionate, obtain the core temperature of the capacitor that occurs when the capacitor is loaded with a ripple current.

$$T = T_a + \Delta T_0 \times \left(\frac{I}{I_R} \right)^2 \qquad (3)$$

Where,

T : Core temperature of the capacitor when ripple current I is loaded

T_a : Ambient temperature

T_0 : Rise in maximum core temperature setting for the capacitor when permissible ripple current IR is loaded

(settings differ in different series or products. Contact us for details)

Note : Observe the rule: I ≦ IR. Never use a capacitor loaded with a ripple current greater than IR.

For safety reasons, estimate the service life on the basis of the core temperature of the capacitor at maximum load. Temperature distribution should be taken into account when more than one capacitor is used.

[Other factors affecting service life]

(1) Reverse voltage

When a reverse voltage is applied to the capacitor, the capacitor's cathode foil that is not coated with oxide is energized, resulting in forced formation of an oxide film on its surface. During the process of forced formation, heat and gases are generated. This will shorten the service life significantly.

(2) Charge and discharge

Generally, where aluminum electrolytic capacitors are used in a charge/discharge circuit, oxide films are gradually formed on the surfaces of their cathode foils due to discharge current. This will shorten the service life significantly. For this reason, general-purpose capacitors are not suitable for circuits in which frequent charge and discharge are common. Examples include circuits for photo flash and welding.

(3) Inrush current

Upon switching on the power supply of a welding machine, a large current flows instantaneously at the beginning of charging. Such a current, called an inrush current, is 10 to 1,000 times as large as the normal value. Inrush currents pose no problem as long as they occur with very low freguent during operation. The reason for this is that their heat-generating energy is relatively small. However, if an inrush current occurs repeatedly during operation, it may shorten the service life significantly.

Reducing Substances with Environmental Impact

As part of our initiatives for global environment protection under ISO 14001, we recommend products without any substances with environmental impact to our customers.

(1) Lead-free

Regarding Snap mount type Aluminum Electrolytic Capacitors, our standard specification is to use Tin instead of Lead on the surface of terminal plating. We discontinued producing Tin + Lead plating. Regarding Screw terminal type Aluminum Electrolytic Capacitors, they do not contain Lead at all.
Please contact us for details.

(2) Eliminating Chromate Treatment

The previous chromate treatment on the surface of bracket contained hexavalent chromium.
To avoid this material, we changed to trivalent chromium.
The surface treatment is changed but no change in size or other specification.
In addition to Lead-free, aluminum electrolytic capacitors that we produce have suited RoHS Directive.

(3) PVC-free

For PVC-free Snap mount type Aluminum Electrolytic Capacitors, the capaciters are covered with PET insulating sleeve, and The bottoms not covered.(Except for PS2/US2 series)
Please contact us for other PVC-free products.

(4) Conform RoHS

All series (Screw terminal type Aluminum Electrolytic Capacitors, Snap mount type Aluminum Electrolytic Capacitors and Aluminum Electrolytic Capacitors for photflash) appy RoHS.