

## Aluminum electrolytic capacitors use instructions

Aluminum electrolytic capacitors may cause an explosion, fire, or other serious trouble if not used under specified operating conditions. Please familiarize yourself with the instructions given below before using these capacitors.

Item		Instructions
Design	<b>Operating temperature and ripple current</b>	<ol style="list-style-type: none"> <li>1. Keep the operating temperature and ripple current in specified ranges. Applying an excessive current to a capacitor will overheat it, resulting perhaps in short-circuit, ignition, or other fatal fault.</li> <li>2. A capacitor is also a heating component itself. Please be on guard, remembering that it heats up the inside of the equipment. Run the unit under normal conditions and check the temperature of the surroundings of the capacitor.</li> <li>3. The permissible ripple current tends to decline with a rise in the atmosphere temperature (the temperature of the surroundings of the capacitor). Consider a permissible ripple current at the maximum predictable atmospheric temperature. Allow also for the changes in frequency.</li> </ol>
	<b>Applied voltage and connections</b>	<ol style="list-style-type: none"> <li>1. Capacitors have polarity. Applying a reverse voltage or AC voltage to a capacitor may cause a fire or other fatal fault.</li> <li>2. Use a bipolar capacitor for circuits whose polarity reverses. However, in this case, like any other case, refrain from using such a capacitor in AC circuit.</li> <li>3. When an AC component is superimposed on a DC voltage, prevent the peak value from exceeding the rated voltage. An excessive voltage may cause a short-circuit, fire, or other fatal fault.</li> <li>4. When connecting more than one capacitor in parallel, consider the resistance of the wiring. Establish the connections so that the wiring resistance will be equal at every capacitor.</li> <li>5. When more than one capacitor is connected in series, all capacitors must be of identical ratings. Then connect the balancing resistors in parallel. At that time, design the circuit so that the voltage levels applied to all capacitors become equal. Check that the voltages applied to capacitors do not exceed a rated voltage.</li> <li>6. Do not use such a capacitor for a circuit that is repeatedly charged and discharged quickly. If you are to use such a capacitor for a welding unit or for other charging and discharging purposes, use a capacitor designed on a separate basis.</li> <li>7. Even slow recharging may shorten the service life of a capacitor if its voltage changes greatly. Check it sufficiently as installed on a larger machine or consult Hitachi AIC.</li> </ol>
	<b>Capacitor insulation</b>	<ol style="list-style-type: none"> <li>1. Do not connect the blank terminal (reinforcing terminal) of a multi-terminal (three- or four-terminal) product of the snap-in type to another circuit. It may cause a short circuit.</li> <li>2. The external sleeve of the snap-in type has no insulator. If you need a sleeve with an insulator, consult Hitachi AIC.</li> <li>3. Ensure a completely open circuit between the case and the cathode terminal, and between the anode terminal and circuit pattern.</li> </ol>
	<b>Operating conditions</b>	<ol style="list-style-type: none"> <li>1. A splash of water, salty water, oil or other electrically conductive liquid on a capacitor or using a capacitor when it has dew on it may cause a breakdown. Oil on the rubber sealing or safety vent may cause a decline in airtightness. Do not use a capacitor with liquid on it.</li> <li>2. Do not use or leave a capacitor in a place where there is a hydrogen sulfide, nitrous acid, sulfurous acid, chlorine, bromine, or other halide compound gas, ammonia, or other hazardous gas. The ingress of any of the aforementioned gases into a capacitor may corrode it. Avoid fumigating and spraying an insecticide as well.</li> <li>3. Do not use or leave a capacitor in a place exposed to ozone, ultraviolet ray, or radiation.</li> <li>4. Do not use a capacitor in a place where vibration or impact is excessive.</li> </ol>
Installation	<b>Before installation</b>	<ol style="list-style-type: none"> <li>1. Do not reverse the polarity. Do not use a capacitor to which a reverse voltage is applied, even if it looks problem-free. It must be greatly damaged.</li> <li>2. Do not tighten the curled part (case sealed part) with a mounting fitting or otherwise stress it. Any such practice may cause a liquid leak or sleeve breakage.</li> <li>3. Dropping or otherwise impacting a capacitor may result in a decline in its electric performance, causing a breakdown. Therefore do not cause an impact on it.</li> <li>4. Do not reuse a capacitor which has been installed on a machine and energized. No capacitor can be reused except for those removed to measure their electric performance for a periodic checkup.</li> </ol>

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<b>Installation</b>	<b>Method of installation</b>	<ol style="list-style-type: none"> <li>Do not make the safety vent (cap side) of a screw terminal type face downwards. The safety vent may let the electrolyte or compound leak.</li> <li>Do not install a wiring or circuit pattern near the safety vent. When the safety vent is activated, the electrolyte may jet out, resulting in a fire or other secondary accident.</li> <li>Avoid installing a heating part around a capacitor or in back of a printed wiring board (beneath the capacitor).</li> <li>Do not hamper the activation of the safety vent. Above the safety vent (where a screw terminal type is installed on the terminal side, or snap-in type on the case bottom), allow for the following clearances:                             <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Capacitor diameter</th> <th>Clearance</th> </tr> </thead> <tbody> <tr> <td>20~35 mm dia or more</td> <td>3 mm or more</td> </tr> <tr> <td>40 mm dia or more</td> <td>5 mm or more</td> </tr> <tr> <td>PS2, US2 series</td> <td>1 mm or more</td> </tr> </tbody> </table> </li> </ol>	Capacitor diameter	Clearance	20~35 mm dia or more	3 mm or more	40 mm dia or more	5 mm or more	PS2, US2 series	1 mm or more			
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<b>On-board self-supporting type (snap-in type) capacitor</b>	<ol style="list-style-type: none"> <li>Soldering such a capacitor as floated from a wiring board may result in one of its terminals breaking or its pattern peeling off when vibrated. Insert a capacitor correctly and tightly into specified holes in the wiring board, then solder it.</li> <li>Flux on the rubber sealing may result in corrosion. Therefore do not let any flux stick to any part other than the terminals.</li> <li>Perform soldering at 260°C for no more than 10 seconds or at 350°C for no more than 3 seconds. Exceeding any specified soldering condition may result in a decline in its electric performance, leading to trouble. Do not let the tip of the soldering iron contact the capacitor.</li> <li>For cleaning flux, Hitachi AIC recommends an aqueous or upmarket alcohol detergent or isopropyl alcohol. The recommended concentration of flux with regard to a detergent is 2wt% or less. Excessively high flux concentration may cause corrosion due to the halide. For other detergents, consult Hitachi AIC.</li> <li>Do not let any flux stick to any part other than the terminals.</li> <li>Dry the detergent well and do not let any of it remain on the capacitor. Even when you are not cleaning the flux, dry the flux itself. A residue of detergent or flux may cause the halide to penetrate the rubber sealing, leading to corrosion. The snap-in type comes in models protected with epoxy resin. For such models, consult Hitachi AIC.</li> <li>When fixing a board and a capacitor with a coating agent or fixative, use a substance containing no halide compound. In that case, dry the flux or detergent well in advance, then apply a coating. Do not let the coating block the entire surface of the sealing. Any halide compound contained in the coating may result in corrosion.</li> <li>If the safety vent of the capacitor is installed on the printed wiring board, drill a gas bleeder hole to let out the gas when the valve is activated, according to the location of the safety vent.</li> <li>Do not twist or otherwise physically move the capacitor after soldering it on a printed wiring board.</li> <li>Do not solder a capacitor as dipped in a solder bath. Solder it only to the back face of the opposite side to the capacitor, via a printed wiring board.</li> <li>Do not use a fixative or coating agent containing a corrosive, such as a halogen-based solvent.</li> <li>Avoid whenever possible the use of an ozone-depleting substance used in a detergent or other material, in order to protect the earth.</li> </ol>												
<b>Screw terminal capacitor</b>	<ol style="list-style-type: none"> <li>The terminal screws, recommended tightening torques, and permissible terminal currents are as listed below. Consult Hitachi AIC if you wish to use such a capacitor on a machine that vibrates greatly.                             <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Terminal</th> <th>Recommended torque (permissible level)</th> <th>Permissible terminal current</th> </tr> </thead> <tbody> <tr> <td>M5</td> <td>2.2 (1.5~3.0)</td> <td>60</td> </tr> <tr> <td>M6</td> <td>3.0 (3.0~3.5)</td> <td>100</td> </tr> <tr> <td>M8</td> <td>7.5 (7.0~8.0)</td> <td>120</td> </tr> </tbody> </table> </li> <li>The terminal screws furnished in a separate shipment are geared to wires no more than 2 mm thick. For wires more than 2 mm thick, ensure a screw length allowing for that thickness.</li> <li>Hitachi AIC recommends a bar hole diameter of 6 mm for M5. An excessively large hole diameter may result in poor contact between the terminal surface and bar, causing a local heatup and thus a breakdown.</li> </ol>	Terminal	Recommended torque (permissible level)	Permissible terminal current	M5	2.2 (1.5~3.0)	60	M6	3.0 (3.0~3.5)	100	M8	7.5 (7.0~8.0)	120
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