

# ALUMINUM ELECTROLYTIC CAPACITORS

## Precautions in using Aluminum Electrolytic Capacitors

If the capacitors are used beyond the prescribed limits, short-circuiting, opening, solution leakage, explosion, ignition, or other fatal failure may occur. The precautions to be taken are detailed below.

Category		Precautions	Failure mode and corrective action
Circuit design	Operating temperature and ripple current	<ol style="list-style-type: none"> <li>1. Ensure that the operating temperature and ripple current are within the prescribed ranges.</li> <li>2. When connecting two or more capacitors in parallel, take the wiring resistance into account.</li> <li>3. The capacitors also generate heat themselves. Keep in mind that they will raise the equipment internal temperature.</li> </ol>	<ol style="list-style-type: none"> <li>1. If an excessive ripple is allowed to flow to the capacitors, shorting, ignition, or other fatal failure can result.</li> <li>2. Make wiring connections so that all capacitors are subjected to the same wiring resistance.</li> <li>3. Operate the equipment under normal conditions to check the equipment internal temperature and capacitor temperature.</li> </ol>
	Applied voltage	<ol style="list-style-type: none"> <li>1. The capacitors are polarized. Do not apply any reverse voltage or AC voltage to them.</li> <li>2. In circuits where polarity reversal occurs, bipolar capacitors must be used.</li> <li>3. When an AC component is superimposed over a DC voltage, ensure that the peak value does not exceed the voltage rating.</li> <li>4. When connecting a number of capacitors in series, use capacitors having the same rating and connect balancing resistors in parallel.</li> <li>5. Do not use the capacitors in circuits where sudden charging/discharging repeatedly occurs.</li> </ol>	<ol style="list-style-type: none"> <li>1. If a reverse voltage or AC voltage is applied to the capacitors, abnormal heat generation can take place, resulting in ignition or other fatal failure.</li> <li>2. Note that even bipolar capacitors cannot be used in AC circuits.</li> <li>3. If a voltage higher than the rating is applied to the capacitors, abnormal heat generation can take place, resulting in shorting, ignition, or other fatal failure.</li> <li>4. When using two or more capacitors, take the above-mentioned wiring resistance into account. If not, the voltage applied to the capacitors may vary to incur capacitor deterioration.</li> <li>5. For charging and discharging a welding machine or other equipment, use dedicated capacitors designed for use in such applications.</li> </ol>
	Capacitor insulation	<ol style="list-style-type: none"> <li>1. Blank terminals (reinforcement terminals) of on-board self-supporting multi-terminal (4-terminal) capacitors must not be connected to any other circuit.</li> <li>2. Note that the external sleeves of on-board self-supporting capacitors are not insulated.</li> </ol>	<ol style="list-style-type: none"> <li>1. The blank terminals are not internally insulated. Take the precautions to avoid circuit shorting.</li> <li>2. If the sleeve has to have an insulation capability, consult your local Hitachi AIC agent.</li> </ol>
	Operating environment	<ol style="list-style-type: none"> <li>1. The capacitors must not be used while they are splashed with water, saline water, or oil or wet with condensed moisture.</li> <li>2. Do not use the capacitors in an atmosphere of hydrogen sulfide, sulfurous acid, chlorine, or other harmful gas.</li> <li>3. Do not use the capacitors at a place where they may be exposed to ozone or ultraviolet or other radiations.</li> <li>4. Do not use the capacitors at a place where they may be subjected to vibration or undue shock.</li> </ol>	<ol style="list-style-type: none"> <li>1. If the capacitors are splashed with water or saline water or get wet with condensed moisture, short-circuiting will occur.</li> <li>If oil is deposited on the capacitors, the sealing rubber can swell, thus impairing airtightness and shortening the useful life.</li> <li>2. A harmful gas will damage the sealing rubber, resulting in interior corrosion and wiring breakage.</li> <li>3. On-board self-supporting capacitors protected with epoxy resin are available. Contact your local Hitachi AIC agent.</li> <li>4. If the capacitors are subjected to excessive vibration or shock, consult your local Hitachi AIC agent.</li> </ol>
	Mounting precautions	<ol style="list-style-type: none"> <li>1. Ensure that screw terminal type safety vents do not face downward.</li> <li>2. Do not position any wiring or circuit conductor pattern near safety vents.</li> <li>3. Be sure that safety vent operations are not disturbed.</li> </ol>	<ol style="list-style-type: none"> <li>1. An electrolytic solution or compound may flow out of the safety vents.</li> <li>2. The electrolytic solution is conductive. Gushing out of a combustible gas upon safety vent actuation can cause ignition or other secondary disaster.</li> <li>3. A screw terminal type safety vent is positioned toward the terminal side. In the case of an on-board self-supporting type, the case bottom swells to actuate the safety vent.</li> </ol>
Mounting	Prior knowledge of mounting	<ol style="list-style-type: none"> <li>1. Use care to avoid polarity reversal.</li> <li>2. Ensure that the curled section (sealed end of the case) is not stressed.</li> <li>3. Use extreme care in handling the capacitors.</li> </ol>	<ol style="list-style-type: none"> <li>1. If a reverse voltage is applied to the capacitors, they must not be used any longer. Even if they have no apparent defects, they are seriously damaged.</li> <li>2. Do not tighten the curled section with a band or the like because solution leakage or sleeve cutting can result.</li> <li>3. If the capacitors fall on the floor or bump against any object, their external surfaces and internal structures can be rendered abnormal, resulting in electrical performance deterioration or destruction. Replace such capacitors.</li> </ol>

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Category		Precautions	Failure mode and corrective action
Mounting	Notes on storing capacitors	<ol style="list-style-type: none"> <li>1. The capacitors must be stored at normal temperature with normal humidity and kept out of direct sunlight. The maximum storage period is three years.</li> <li>2. There may be cases where an electric charge is generated due to transient phenomena. To avoid electrical shock hazard, do not touch the terminals with bare hands.</li> </ol>	<ol style="list-style-type: none"> <li>1. After the capacitors have been stored for a period of more than 3 years, subject them to voltage treatment.</li> <li>2. Before touching the terminals, discharge them with a resistor (10 to 100Ω) or discharge plate.</li> </ol>
	On-board self-supporting (snap-in) capacitors	<ol style="list-style-type: none"> <li>1. Properly insert the capacitors into the wiring board. Solder them while they are in close contact with the wiring board.</li> <li>2. Ensure that the flux is not applied to portions other than the terminal section.</li> <li>3. Soldering must be conducted within 10 seconds at 260°C or within 3 seconds at 350°C.</li> <li>4. For washing off the flux, the use of water-soluble or high-grade alcoholic cleaning agent or isopropyl alcohol is recommended. It is also recommended that the flux concentration be 2 wt% relative to the cleaning agent.</li> <li>5. After the use of cleaning solution, it must be allowed to dry. Even when the flux is not to be removed, allow it to dry.</li> <li>6. When securing a capacitor to a circuit board with a coating or a fixing material, be sure that the employed coating or fixing material does not contain halogen compounds. Before coating the capacitor, allow the flux or cleaning agent to dry completely.</li> <li>7. When securing a capacitor to a circuit board with a coating or a fixing material, use care so that the sealed end of the capacitor is not entirely covered. Ensure, also, that no coating or fixing material is applied to the safety vent section at the bottom of capacitor. When conducting overall coating, consult your local Hitachi AIC agent.</li> </ol>	<ol style="list-style-type: none"> <li>1. If the capacitors are soldered while they are lifted above the wiring board, terminal breakage or conductive pattern separation can be caused by mechanical vibration or shock.</li> <li>2. If the flux comes into contact with the sealing rubber surface, corrosion can be caused by the halogen compound in the flux.</li> <li>3. If soldering is conducted without satisfying the prescribed soldering conditions, the capacitors will be thermally stressed so that electrical characteristic deterioration or other problem can occur.</li> <li>4. If the flux concentration in the cleaning solution rises, the halogen concentration also increases. Therefore, corrosion can occur as indicated in paragraph 2 above.</li> <li>5. If any cleaning solution or flux remains between the circuit board and capacitor, the halogen compound can permeate into the sealing rubber, resulting in corrosion.</li> <li>6. If the employed coating or fixing material contains a halogen compound, corrosion can take place.</li> <li>7. If the overall coating method is employed, the flux or cleaning solution halogen compound residue is confined so that corrosion can occur.</li> </ol> <p>If a coating or a fixing material is applied to the safety vent section, the safety vent operations will be obstructed.</p>
	Screw terminal type capacitors	<ol style="list-style-type: none"> <li>1. The terminal section tightening torque should be 2.2 N-m (3.0 N·m max.) When using the capacitors in significantly vibrating equipment, consult your local Hitachi AIC agent.</li> </ol>	<ol style="list-style-type: none"> <li>1. If the copper bar or the like exceeds 2.0 mm in length, the screw length should be increased accordingly.</li> </ol>
During use	Test run	<ol style="list-style-type: none"> <li>1. Before allowing the capacitors to conduct, mount them on a chassis.</li> </ol>	<ol style="list-style-type: none"> <li>1. If any abnormally high voltage is applied to the capacitors, they can explode.</li> </ol>
Preventive maintenance		<ol style="list-style-type: none"> <li>1. Capacitors used in industrial equipment must be inspected on a periodic basis. The inspection items are as follows:           <ol style="list-style-type: none"> <li>(1) Appearance (e.g., safety vent condition)</li> <li>(2) Electrical performance (e.g., capacitance, power loss, current leakage)</li> </ol> </li> <li>2. If the capacitors have reached the end of their useful life, they must be replaced.</li> </ol>	<ol style="list-style-type: none"> <li>1. Before performing periodic maintenance tasks, turn OFF the switch and allow the capacitors to completely discharge.</li> <li>2. If any capacitor in equipment needs to be replaced, replace all the capacitors used in the same equipment. If new and old ones are used together, an unbalanced ripple current or voltage sharing can result.</li> </ol>
Disposal		<ol style="list-style-type: none"> <li>1. When disposing of the capacitors, hole or crush their cases and then incinerate them.</li> <li>2. When the capacitors are not to be incinerated, they must be buried by an expert industrial waste disposal agent.</li> </ol>	<ol style="list-style-type: none"> <li>1. If an attempt is made to incinerate the capacitors without holing or crushing their cases, they will explode, resulting in a safety hazard. Be sure that incineration is conducted at high temperature. If it is done at low temperature, chlorine or other poisonous gas may be generated from the external sleeves (made of polyvinyl chloride).</li> <li>2. When the capacitors are disposed of by an industrial waste disposal agent, verify that they are properly buried. Ensure that no discarded capacitors will be put back on the market.</li> </ol>
Other		<ol style="list-style-type: none"> <li>1. For further details, refer to EIAJ RCR-2367, Precautions and Guidelines for Using Electronic Device Fixed Aluminum Nonsolid Electrolytic Capacitors.</li> <li>2. If you have any questions, feel free to contact your local Hitachi AIC agent.</li> </ol>	

# ALUMINUM ELECTROLYTIC CAPACITORS

## Large Can Aluminum Electrolytic Capacitors

### HGG7 series [Small size] (Warranty of 2000 hours at 85°C)

The size is reduced by 15% of HGG6 series through development of new foil technology and has the same permissible ripple current capability as HCG6 series.

### HCGH series [105° type] (Warranty of 2000 hours at 105°C)

Small in size and large power high ripple current aluminum electrolytic capacitors with a 2000 hour long life at 105°C through development of new electrolyte.

### HCGF5, HCGF5P series [High-ripple type for inverters] (Warranty of 2000 hours at 85°C)

Products that have been supplied as standard for many years.

### HCGF6 series [Large capacitance type for inverters] (Warranty of 2000 hours at 85°C)

The size is reduced by 14% of HCGF5, and high voltage series 500 VDC.

Long-life series for inverters

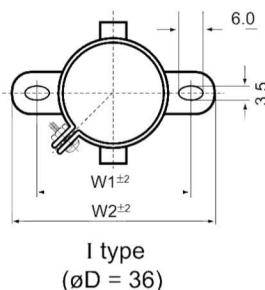
### FXA series (Warranty of 5000 hours at 85°C)

### HXA series (Warranty of 20000 hours at 85°C)

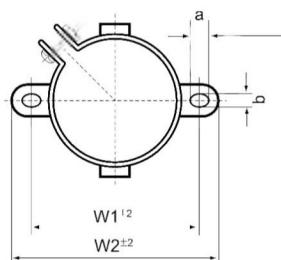
### GXA series (Warranty of 5000 hours at 105°C)

Adoption of electrolytic liquid of organic acid family, foil technology for high voltage use and improved etching technique have allowed a long life and high ripple current capability of this series for inverter applications.

Outline of drawings and dimensions (Unit : mm)



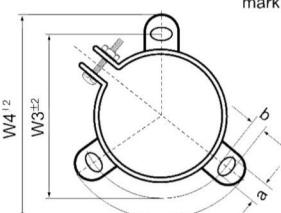
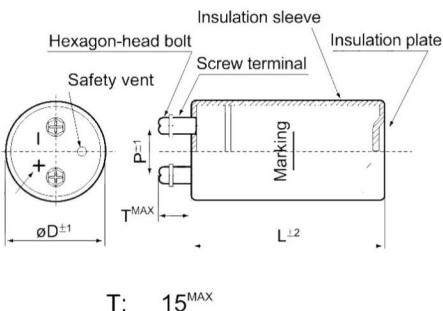
I type  
(øD = 36)



I type  
(øD = 51 to 90)

øD	a	b
51 ~ 77	6	4.5
90	7	5

Hexagon-head bolt  
Case code (A to F): M5×10  
Case code (G): M6×10



Y type  
(øD = 51 to 101)

øD	a	b
51 ~ 90	7	4.5
101	8	4.5

Dimensions (Unit : mm)

Case code	øD	L	P	I type bracket		Y type bracket	
				W1	W2	W3	W4
A5	36	53	12.7	48.0	58.0		
A6	36	65	12.7	48.0	58.0		
A8	36	83	12.7	48.0	58.0		
A10	36	100	12.7	48.0	58.0		
A12	36	121	12.7	48.0	58.0		
C8	51	83	22.0	(68.0)	(80.0)	63.5	73.0
C10	51	100	22.0	(68.0)	(80.0)	63.5	73.0
C12	51	121	22.0	(68.0)	(80.0)	63.5	73.0
D10	64	100	28.6	(81.0)	(93.0)	76.2	85.1
D12	64	121	28.6	(81.0)	(93.0)	76.2	85.1
D15	64	144	28.6	(81.0)	(93.0)	76.2	85.1
E10	77	100	32.0	(93.5)	(106.0)	88.9	98.4
E12	77	121	32.0	(93.5)	(106.0)	88.9	98.4
E15	77	144	32.0	(93.5)	(106.0)	88.9	98.4
E16	77	160	32.0	(93.5)	(106.0)	88.9	98.4
F15	90	145	32.0	(108.0)	(120.5)	101.6	111.1
F16	90	161	32.0	(108.0)	(120.5)	101.6	111.1
C8R	51	75	22.0	(68.0)	(80.0)	63.5	73.0
C10R	51	96	22.0	(68.0)	(80.0)	63.5	73.0
C12R	51	115	22.0	(68.0)	(80.0)	63.5	73.0
C13R	51	130	22.0	(68.0)	(80.0)	63.5	73.0
D10R	64	96	28.6	(81.0)	(93.0)	76.2	85.1
D12R	64	115	28.6	(81.0)	(93.0)	76.2	85.1
D13R	64	130	28.6	(81.0)	(93.0)	76.2	85.1
D16R	64	155	28.6	(81.0)	(93.0)	76.2	85.1
D20R	64	195	28.6	(81.0)	(93.0)	76.2	85.1
E10R	77	96	32.0	(93.5)	(106.0)	88.9	98.4
E12R	77	115	32.0	(93.5)	(106.0)	88.9	98.4
E13R	77	130	32.0	(93.5)	(106.0)	88.9	98.4
E16R	77	155	32.0	(93.5)	(106.0)	88.9	98.4
E17R	77	171	32.0	(93.5)	(106.0)	88.9	98.4
E20R	77	195	32.0	(93.5)	(106.0)	88.9	98.4
F13R	90	131	32.0	(108.0)	(120.5)	101.6	111.1
F16R	90	157	32.0	(108.0)	(120.5)	101.6	111.1
F17R	90	171	32.0	(108.0)	(120.5)	101.6	111.1
F20R	90	196	32.0	(108.0)	(120.5)	101.6	111.1
F24R	90	236	32.0	(108.0)	(120.5)	101.6	111.1
G18R	101	175	32.0 (41.5)	—	—	115	127
G20R	101	195	32.0 (41.5)	—	—	115	127
G24R	101	237	32.0 (41.5)	—	—	115	127

Note: Y type bracket is standard for case diameter or over øD51, but when I type bracket is required, the size of ( ) is used.