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Motor Run Capacitors

# C87 Series, Cylindrical Aluminum Case, Overpressure Protection, 420 VAC/470 VAC

Electronic Components
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## Overview

Polypropylene metallized film with cylindrical aluminium can type filled with resin; faston, plastic deck or cable terminals and overpressure safety device.

## Applications

Typical applications include motor run P2 safety class: single-phase motors, low power electric motors and compressors.

## Benefits

- Self-healing
- VDE, CQC and UL810 approved
- Rated frequency of 50 Hz and 60 Hz
- High capacitance density
- Safety device protection



## Part Number System

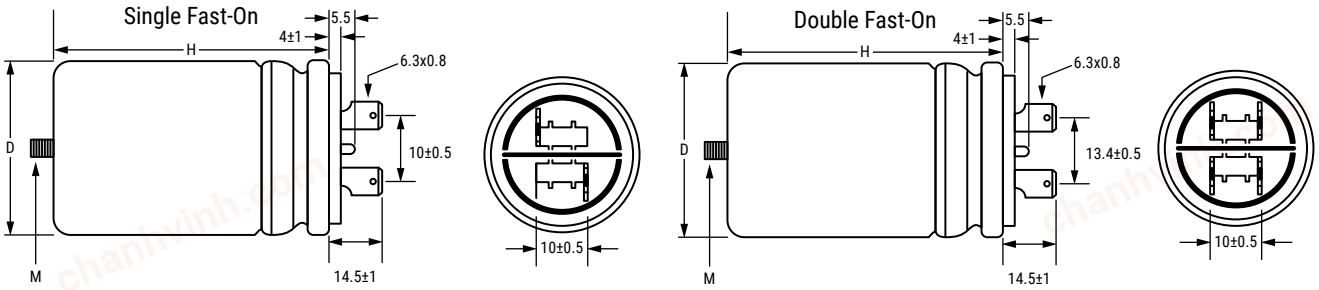
| C87 | 8 | B | F | 3 | 4300 | AA | 4 | J |
|---|---|---|---|---|---|---|---|---|
| Series | | Marking | Case & Fixing Bolt Code | Terminal Style | Capacitance Code (pF) | Packaging | Internal Use | Tolerance |
| C87 = Motor Run Capacitors | 0 = 10,000 hours/420 VAC (Class B) or 3,000 hours/470 VAC (Class C)<br>8 = 30,000 hours/420 VAC (Class A) or 10,000 hours/470 VAC (Class B) | C870:<br>C = Standard<br>D = UL<br>Z = Special<br>C878:<br>A = Standard<br>B = UL<br>Z = Special | F = Cylindrical aluminum can with M8 bolt<br>G = Cylindrical aluminum can with M12 bolt<br>E= Without fixing bolt/flat bottom | 1 = Single faston 2.8 x 0.8 (hole)<br>2 = Single faston 6.3 x 0.8<br>3 = Double faston 6.3 x 0.8<br>4 = Single faston 2.8 x 0.8 (slot)<br>5 = Single faston 2.8 x 0.5 (hole) | Digits two – four indicate the first three digits of the capacitance value.<br>First digit indicates the number of zeros to be added. | AA = Standard | 0, 1, 2, 4, 5 = Standard | J = 5%<br>K = 10%<br>R = 0 to +10%<br>X = Special tolerance |


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## Dimensions – Millimeters




| D | H | Mounting Stud (M) |
|---|---|---|
| +1/−0 | ±2 | |
| 25 | 48 | M8 x 10 |
| 25 | 60 | M8 x 10 |
| 25 | 78 | M8 x 10 |
| 30 | 48 | M8 x 10 |
| 30 | 60 | M8 x 10 |
| 30 | 78 | M8 x 10 |
| 35 | 48 | M8 x 10 |
| 35 | 60 | M8 x 10 |
| 35 | 78 | M8 x 10 |
| 35 | 98 | M8 x 10 |
| 40 | 78 | M8 x 10 |
| 40 | 98 | M8 x 10 |
| 45 | 78 | M8 x 10 |
| 45 | 98 | M8 x 10 |
| 45 | 133 | M8 x 10 |
| 50 | 133 | M12 x 12.5 |
| 55 | 133 | M12 x 12.5 |
| 60 | 98 | M12 x 12.5 |
| 60 | 133 | M12 x 12.5 |

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## Performance Characteristics

| Type of Service | Continuous |
|---|---|
| Operating Class | |
| C87/8 | Class B 10,000 hours at 470 VAC, Class A 30,000 hours at 420 VAC |
| C87/0 | Class B 10,000 hours at 420 VAC, Class C 3,000 hours at 470 VAC |
| C87/1 | None |
| C87/5 | None |
| Temperature Range | –25 to +85°C |
| Rated Voltage | 470 VAC |
| Rated Frequency | 50 – 60 Hz |
| Voltage Rise/Fall Time (Maximum) | 0 = 15 V/µs<br>8 = 20 V/µs |
| Maximum Permissible Voltage | 1.10 x rated voltage |
| Maximum Permissible Current | 1.30 x rated current |
| Dissipation Factor (DF) | 20 x $10^{-4}$ at +20°C, 50 Hz |
| Safety Class | P2 |
| Maximum Altitude | 2,000 m |
| Capacitance Tolerance | ±5% |
| Mounting | Any position |
| Case | Aluminium |
| Disk | Thermoplastic Polymer V0 (UL 94)<br>Plastic deck with:<br>- self-extinguishing features V0 (UL94)<br>- GWT–GWFI–GWIT value in conformity with the Standard IEC60335–1 ed.4 par.30/EN60335–1 ed.3 par.30 |
| Filling Resin | Polyurethane |
| Dielectric | Polypropylene |
| Plates | Self-healing metal layer |
| Test Voltage Terminal to Terminal ($V_{TT}$) | 2 $V_n$ for 2 seconds |
| Test Voltage Terminal to Can ($V_{TC}$) | 2,000 V for 2 seconds |
| Total Harmonic Distortion | Up to 10% |
| Fire Load | 40 MJ/kg |
| Air Distance Between Live Parts | ≥ 5 mm |
| Air Distance Between Live Parts and Case | ≥ 6 mm |
| Vibration Test | IEC 68–2–6 |
| Maximum Tightening Torque | 5 Nm (M8), 10 Nm (M12) |

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## Table 1 – Ratings & Part Number Reference

| Capacitance Value (µF) | VAC | Maximum Dimensions in mm | | dV/dt (V/µs) | Termination | Part Number |
|---|---|---|---|---|---|---|
| | | D | H | | | |
| 16 | 470 | 40 | 78 | 15 | Double Fast-On | C870CF35160AA1J |
| 18 | 470 | 40 | 78 | 15 | Double Fast-On | C870CF35180AA0J |
| 20 | 470 | 35 | 98 | 15 | Double Fast-On | C870CF35200AA0J |
| 20 | 470 | 35 | 98 | 15 | Double Fast-On | C870CF35200AA1J |
| 22 | 470 | 40 | 78 | 15 | Double Fast-On | C870CF35220AA0J |
| 25 | 470 | 45 | 78 | 15 | Double Fast-On | C870CF35250AA0J |
| 25 | 470 | 40 | 98 | 15 | Double Fast-On | C870CF35250AA1J |
| 30 | 470 | 40 | 98 | 15 | Double Fast-On | C870CF35300AA1J |
| 35 | 470 | 45 | 98 | 15 | Double Fast-On | C870CF35350AA0J |
| 40 | 470 | 45 | 98 | 15 | Double Fast-On | C870CF35400AA0J |
| 45 | 470 | 45 | 133 | 15 | Double Fast-On | C870CF35450AA0J |
| 50 | 470 | 50 | 133 | 15 | Double Fast-On | C870CG35500AA1J |
| 60 | 470 | 60 | 98 | 15 | Double Fast-On | C870CG35600AA5J |
| 70 | 470 | 55 | 133 | 15 | Double Fast-On | C870CG35700AA1J |
| 75 | 470 | 60 | 133 | 15 | Double Fast-On | C870CG35750AA0J |
| 75 | 470 | 50 | 133 | 15 | Double Fast-On | C870CG35750AA2J |
| 80 | 470 | 50 | 133 | 15 | Double Fast-On | C870CG35800AA2J |
| 100 | 470 | 55 | 133 | 15 | Double Fast-On | C870CG36100AA0J |
| 100 | 470 | 55 | 133 | 15 | Double Fast-On | C870CG36100AA0K |
| 100 | 470 | 60 | 133 | 15 | Double Fast-On | C870CG36100AA1J |
| 110 | 470 | 60 | 133 | 15 | Double Fast-On | C870CG36110AA0J |
| 1 | 450 | 30 | 48 | 20 | Double Fast-On | C878BF34100SA4J |
| 1.5 | 450 | 30 | 48 | 20 | Double Fast-On | C878BF34150SA4J |
| 1.8 | 450 | 30 | 48 | 20 | Double Fast-On | C878ZF34180SA0J |
| 2 | 450 | 30 | 48 | 20 | Double Fast-On | C878BF34200SA0J |
| 2.5 | 450 | 30 | 48 | 20 | Double Fast-On | C878BF34250SA4J |
| 3 | 450 | 30 | 48 | 20 | Double Fast-On | C878BF34300SA4J |
| 3.5 | 450 | 35 | 48 | 20 | Double Fast-On | C878BF34350SA4J |
| 4 | 450 | 35 | 48 | 20 | Double Fast-On | C878BF34400SA0J |
| 5 | 450 | 30 | 60 | 20 | Double Fast-On | C878BF34500SA0J |
| 6 | 450 | 30 | 78 | 20 | Double Fast-On | C878BF34600SA0J |
| 7.5 | 450 | 30 | 78 | 20 | Double Fast-On | C878BF34750SA0J |
| 8 | 450 | 30 | 78 | 20 | Double Fast-On | C878BF34800SA0J |
| 10 | 450 | 35 | 78 | 20 | Double Fast-On | C878BF35100SA0J |
| 11 | 450 | 35 | 78 | 20 | Double Fast-On | C878BF35110SA0J |
| 12 | 450 | 35 | 78 | 20 | Double Fast-On | C878BF35120SA0J |
| 15 | 450 | 40 | 78 | 20 | Double Fast-On | C878BF35150SA0J |
| 16 | 450 | 40 | 78 | 20 | Double Fast-On | C878BF35160SA0J |
| 20 | 450 | 45 | 78 | 20 | Double Fast-On | C878BF35200SA0J |
| 23 | 450 | 45 | 78 | 20 | Double Fast-On | C878BF35230SA0J |
| 25 | 450 | 45 | 98 | 20 | Double Fast-On | C878BF35250SA0J |
| 29 | 450 | 45 | 98 | 20 | Double Fast-On | C878BF35290SA0J |
| 30 | 450 | 45 | 98 | 20 | Double Fast-On | C878BF35300SA0J |
| 46 | 450 | 45 | 133 | 20 | Double Fast-On | C878BF35460SA0J |
| 50 | 450 | 50 | 133 | 20 | Double Fast-On | C878BF35500SA0J |
| 55 | 450 | 50 | 133 | 20 | Double Fast-On | C878BF35550SA0J |
| 60 | 450 | 50 | 133 | 20 | Double Fast-On | C878BF35600SA0J |
| 8 | 470 | 30 | 78 | 20 | Single Fast-On | C878AF24800AA0J |
| 8 | 470 | 35 | 78 | 20 | Single Fast-On | C878AF24800AA1J |
| 10 | 470 | 35 | 78 | 20 | Single Fast-On | C878AF25100AA0J |
| 12 | 470 | 35 | 78 | 20 | Single Fast-On | C878AF25120AA0J |
| 12 | 470 | 40 | 78 | 20 | Single Fast-On | C878AF25120AA1J |
| 16 | 470 | 40 | 78 | 20 | Single Fast-On | C878AF25160AA0J |
| 16 | 470 | 40 | 98 | 20 | Single Fast-On | C878AF25160AA1J |
| 20 | 470 | 45 | 78 | 20 | Single Fast-On | C878AF25200AA0J |
| 25 | 470 | 45 | 98 | 20 | Single Fast-On | C878AF25250AA0J |
| 30 | 470 | 45 | 98 | 20 | Single Fast-On | C878AF25300AA0J |
| 40 | 470 | 45 | 133 | 20 | Single Fast-On | C878AF25400AA0J |
| 1 | 470 | 30 | 48 | 20 | Double Fast-On | C878AF34100AA4J |
| 2 | 470 | 30 | 48 | 20 | Double Fast-On | C878AF34200AA4J |
| 2.5 | 470 | 30 | 48 | 20 | Double Fast-On | C878AF34250AA4J |
| **Capacitance Value (µF)** | **VAC** | **B (mm)** | **H (mm)** | **dV/dt (V/µs)** | **Termination** | **Part Number** |

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## Table 1 – Ratings & Part Number Reference cont'd

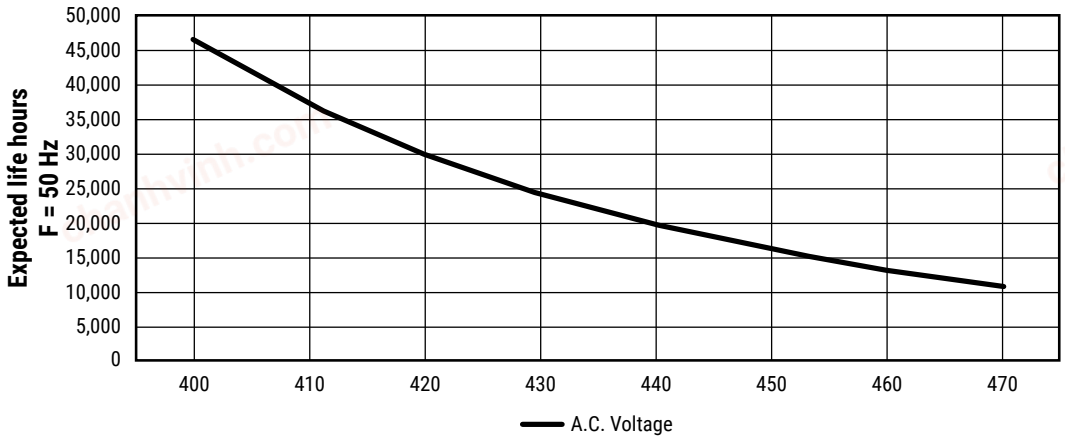
| Capacitance Value (µF) | VAC | Maximum Dimensions in mm | | dV/dt (V/µs) | Termination | Part Number |
|---|---|---|---|---|---|---|
| | | D | H | | | |
| 3 | 470 | 30 | 48 | 20 | Double Fast-On | C878AF34300AA4J |
| 3.5 | 470 | 35 | 48 | 20 | Double Fast-On | C878AF34350AA4J |
| 4 | 470 | 35 | 48 | 20 | Double Fast-On | C878AF34400AA4J |
| 5 | 470 | 35 | 48 | 20 | Double Fast-On | C878AF34500AA4J |
| 6 | 470 | 30 | 78 | 20 | Double Fast-On | C878AF34600AA0J |
| 6 | 470 | 35 | 78 | 20 | Double Fast-On | C878AF34600AA1J |
| 7.5 | 470 | 30 | 78 | 20 | Double Fast-On | C878AF34750AA0J |
| 7.5 | 470 | 35 | 60 | 20 | Double Fast-On | C878AF34750AA2J |
| 8 | 470 | 30 | 78 | 20 | Double Fast-On | C878AF34800AA0J |
| 9 | 470 | 35 | 78 | 20 | Double Fast-On | C878AF34900AA0J |
| 10 | 470 | 35 | 78 | 20 | Double Fast-On | C878AF35100AA0J |
| 11 | 470 | 35 | 78 | 20 | Double Fast-On | C878AF35110AA0J |
| 12 | 470 | 35 | 78 | 20 | Double Fast-On | C878AF35120AA0J |
| 12 | 470 | 40 | 78 | 20 | Double Fast-On | C878AF35120AA1J |
| 12.5 | 470 | 35 | 78 | 20 | Double Fast-On | C878AF35125AA0J |
| 14 | 470 | 40 | 78 | 20 | Double Fast-On | C878AF35140AA0J |
| 15 | 470 | 40 | 78 | 20 | Double Fast-On | C878AF35150AA0J |
| 16 | 470 | 40 | 78 | 20 | Double Fast-On | C878AF35160AA0J |
| 16 | 470 | 40 | 98 | 20 | Double Fast-On | C878AF35160AA1J |
| 16 | 470 | 35 | 98 | 20 | Double Fast-On | C878AF35160AA2J |
| 18 | 470 | 45 | 78 | 20 | Double Fast-On | C878AF35180AA0J |
| 20 | 470 | 45 | 78 | 20 | Double Fast-On | C878AF35200AA0J |
| 22.5 | 470 | 45 | 78 | 20 | Double Fast-On | C878AF35225AA0J |
| 25 | 470 | 45 | 98 | 20 | Double Fast-On | C878AF35250AA0J |
| 30 | 470 | 45 | 98 | 20 | Double Fast-On | C878AF35300AA0J |
| 30 | 470 | 45 | 133 | 20 | Double Fast-On | C878AF35300AA1J |
| 31.5 | 470 | 45 | 98 | 20 | Double Fast-On | C878AF35315AA0J |
| 35 | 470 | 45 | 133 | 20 | Double Fast-On | C878AF35350AA0J |
| 40 | 470 | 45 | 133 | 20 | Double Fast-On | C878AF35400AA0J |
| 40 | 470 | 50 | 133 | 20 | Double Fast-On | C878AG35400AA2J |
| 45 | 470 | 50 | 133 | 20 | Double Fast-On | C878AG35450AA0J |
| 50 | 470 | 50 | 133 | 20 | Double Fast-On | C878AG35500AA0J |
| 50 | 470 | 55 | 133 | 20 | Double Fast-On | C878AG35500AA1J |
| 55 | 470 | 50 | 133 | 20 | Double Fast-On | C878AG35550AA0J |
| 60 | 470 | 50 | 133 | 20 | Double Fast-On | C878AG35600AA0J |
| 60 | 470 | 60 | 133 | 20 | Double Fast-On | C878AG35600AA1J |
| 80 | 470 | 60 | 133 | 20 | Double Fast-On | C878AG35800AA0J |
| **Capacitance Value (µF)** | **VAC** | **B (mm)** | **H (mm)** | **dV/dt (V/µs)** | **Termination** | **Part Number** |

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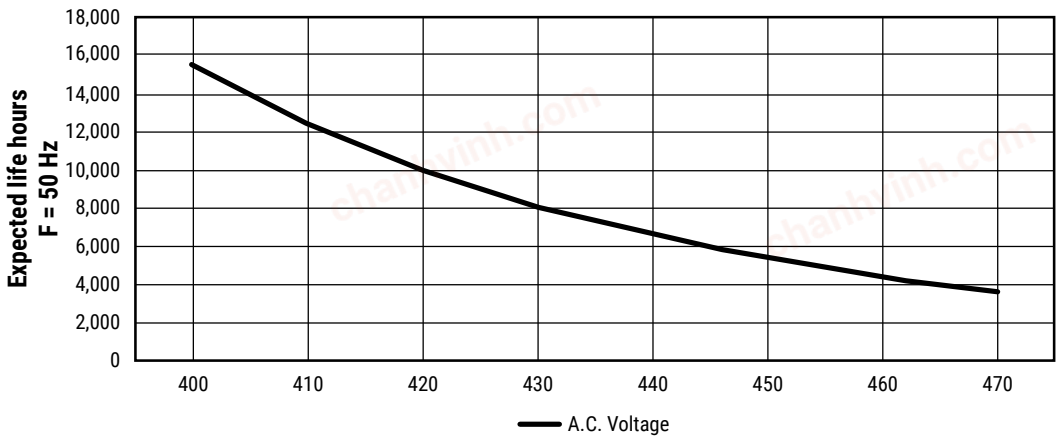


## Expected Life Hours

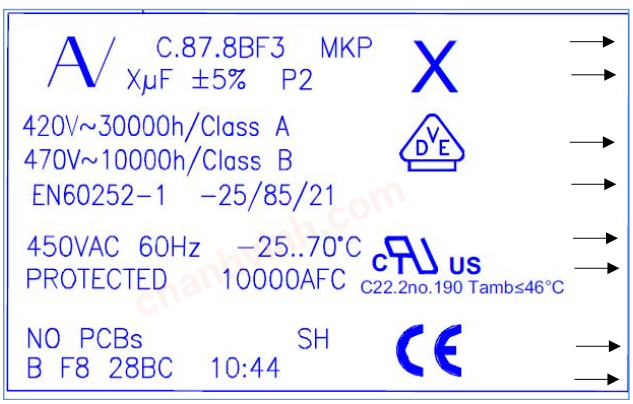
### C878




### C870




## Marking




**MKP C87**
**Capacitance Tolerance/Safety Class**
**Capacitor Class**
**Climate Class**
**Rated Voltage based on UL Standards**
**UL Approvals**
**Self-Healing dielectric**
**Data Code**

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## Dissipation Factor

Dissipation factor is a complex function involved with the inefficiency of the capacitor. The tgδ may change up and down with increased temperature. For more information, please refer to Performance Characteristics.

## Sealing

**Hermetically Sealed Capacitors**
When the temperature increases, the pressure inside the capacitor increases. If the internal pressure is high enough, it can cause a breach in the capacitor which can result in leakage, impregnation, filling fluid or moisture susceptibility.

**Resin Encased/Wrap & Fill Capacitors**
The resin seals on resin encased and wrap and fill capacitors will withstand short-term exposure to high humidity environments without degradation. Resins and plastic tapes will form a pseudo-impervious barrier to humidity and chemicals. These case materials are somewhat porous and through osmosis can cause contaminants to enter the capacitor. The second area of contaminated absorption is the lead-wire/resin interface. Since resins cannot bond 100% to tinned wires, there can be a path formed up to the lead wire into the capacitor section. Aqueous cleaning of circuit boards can aggravate this condition.

**Barometric Pressure**
The altitude at which hermetically sealed capacitors are operated controls the voltage rating of the capacitor. As the barometric pressure decreases, the susceptibility to terminal arc-over increases. Non-hermetic capacitors can be affected by internal stresses due to pressure changes. This can be in the form of capacitance changes or dielectric arc-over as well as low insulation resistance. Heat transfer can also be affected by altitude operation. Heat generated in operation cannot be dissipated properly and can result in high RI2 losses and eventual failure.

**Radiation**
Radiation capabilities of capacitors must be taken into consideration. Electrical degradation in the form of dielectric embitterment can take place causing shorts or opens.

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## Environmental Compliance

As an environmentally conscious company, KEMET is working continuously with improvements concerning the environmental effects of both our capacitors and the production of them.

In Europe (RoHS Directive) and in some other geographical areas like China, legislation has been put in place to prevent the use of some hazardous materials, like Lead (Pb), in electronic equipment. All products in this catalog are produced to help our customers' obligations to guarantee their products to fulfill these legislative requirements. The only material of concern in our products has been Lead (Pb), which has been removed from all designs to fulfill the requirement of containing less than 0.1% of lead in any homogeneous material.

KEMET will closely follow any changes in legislation world wide and makes any necessary changes in its products, whenever needed.

Some customer segments like Medical, Military and Automotive Electronics may still require the use of Lead in electrode coatings. To clarify the situation and distinguish products from each other, a special symbol is used on the packaging labels for RoHS compatible and Pb-Free capacitors.

Because of customer requirements, additional markings such as "LF" for lead-free or "LFW" for lead-free wires may appear on the packaging label.

## Materials & Environment

The selection of materials used by KEMET for the production of capacitors is the result of extensive experience and constant attention to environmental protection. KEMET selects its suppliers according to ISO 9001 standards and carries out statistical analysis on the materials purchased before acceptance. All materials are, to the company's present knowledge, non-toxic and free from cadmium, mercury, chrome and compounds, polychlorine triphenyl (PCB), bromide and chlorine dioxins bromurate clorurate, CFC and HCFC, and asbestos.

## Green Products

All KEMET power film products are ROHS Compliant.

## Insulation Resistance

When the capacitor temperature increases, the insulation resistance decreases. This is due to increased electron activity. Low insulation resistance can also be the result of moisture trapped in the windings, caused by a prolonged exposure to excessive humidity.

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Although KEMET designs and manufactures its products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product–related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicted or that other measures may not be required.

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