Motor Run Capacitors

# C28, Cylindrical Plastic Case, Segmented Film 420 VAC/470 VAC

## Overview

The C28 capacitor is a polypropylene metallized segmented film capacitor with a cylindrical, plastic can-type design filled with resin. It uses faston and plastic deck, or cable terminals.

## Applications

Typical applications include motor run S3 safety class: single-phase motors, low power electric motors, and compressors.

## Benefits

- Self-healing
- IMQ approved
- Rated frequency of 50 Hz and 60 Hz
- High capacitance density
- Safety protection



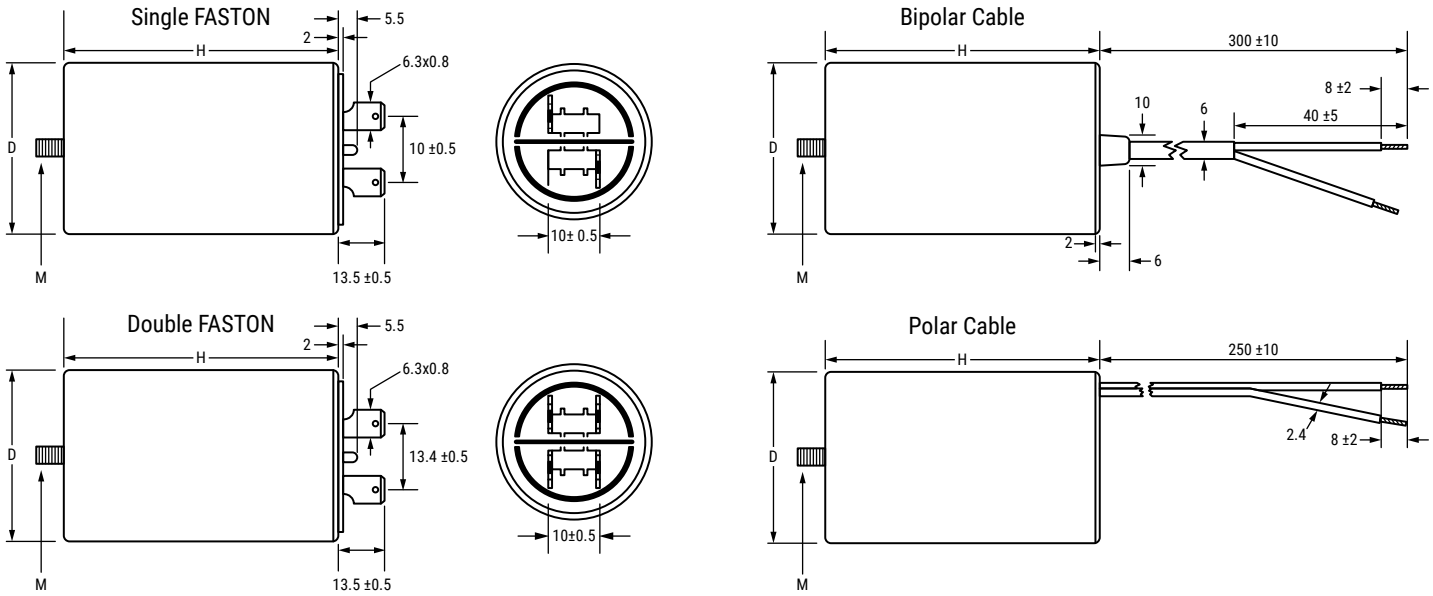
## Part Number System

| C28 | 4 | A | C | A | 4300 | AL | 0 | J |
|---|---|---|---|---|---|---|---|---|
| Series | | Marking | Case and Fixing Bolt Code | Terminal Style | Capacitance Code (pF) | Packaging | Internal Use | Tolerance |
| C28 = Motor Run Capacitors | 4 = 30,000 hours/ 420 VAC (Class A) or 10,000 hours/ 470 VAC (Class B) | C284: A = Standard | A = Without fixing bolt/flat bottom<br>C = Cylindrical plastic case with M8 bolt<br>D = Quick fit | 2 = Single FASTON 6.3 x 0.8<br>3 = Double FASTON 6.3 x 0.8<br>A = Unipolar flexible cable (tinned end)<br>B = Unipolar flexible cable (untinned end)<br>F = Bipolar cable (tinned end)<br>R = Unipolar rigid cable (tinned end) | Digits two – four indicate the first three digits of the capacitance value. First digit indicates the number of zeros to be added. | AA = FASTON terminals standard<br>AL = Unipolar cable L = 300 mm, stripped 8 mm<br>LF = Bipolar cable L= 250 mm unsheathed 40 mm, stripped 8 mm<br>LH = Bipolar cable L = 350 mm unsheathed 40 mm, stripped 8 mm | 0, 1, 2, 5 = Standard | J = 5% |



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## Dimensions – Millimeters




| D | H | Mounting Stud (M) |
|---|---|---|
| +1/-0 | ±2 | |
| 25 | 56.5 | M8 x 10 |
| 25 | 58 | M8 x 11 |
| 25 | 55 | M8 x 12 |
| 25 | 58.5 | M8 x 13 |
| 25 | 57 | M8 x 14 |
| 30 | 56.5 | M8 x 15 |
| 30 | 55 | M8 x 16 |
| 30 | 69.5 | M8 x 17 |
| 30 | 58.5 | M8 x 18 |
| 30 | 57 | M8 x 19 |
| 35 | 56.5 | M8 x 20 |

| D | H | Mounting Stud (M) |
|---|---|---|
| +1/-0 | ±2 | |
| 35 | 73.5 | M8 x 21 |
| 35 | 55 | M8 x 22 |
| 35 | 57 | M8 x 23 |
| 35 | 71.5 | M8 x 24 |
| 35 | 74 | M8 x 25 |
| 35 | 69.5 | M8 x 26 |
| 35 | 58.5 | M8 x 27 |
| 40 | 73.5 | M8 x 28 |
| 40 | 71.5 | M8 x 29 |
| 40 | 74 | M8 x 30 |
| 40 | 69.5 | M8 x 31 |

## Qualifications

| | |
|---|---|
| Reference Standards | IEC 252, EN 60252-1:2011/A1/2013, IMQ |
| Vibration Test | IEC 68-2-6 |

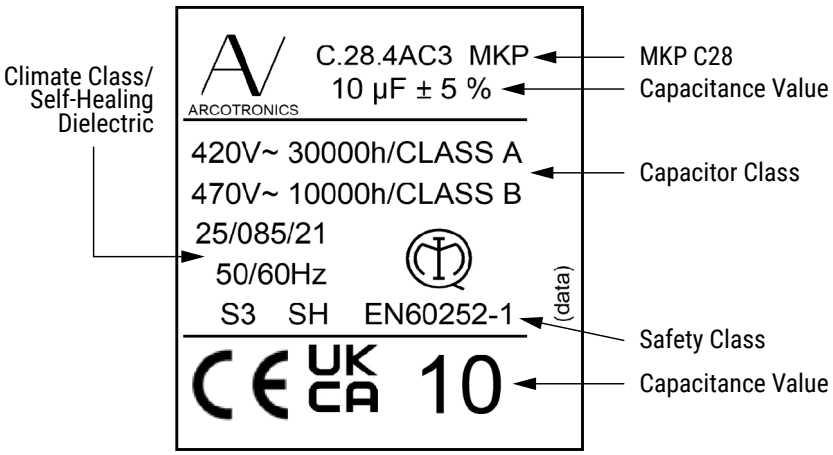
## Performance Characteristics

| Type of Service | Continuous |
|---|---|
| Operating Class | |
| C284 | Class A 30,000 hours at 420 VAC or Class B 10,000 hours at 470 VAC |
| Temperature Range | −25°C to +85°C |
| Storage Temperature | −40°C to +90°C |
| Rated Voltage | 470 VAC |
| Rated Frequency | 50 – 60 Hz |
| Voltage Rise/Fall Time (Maximum) | 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 | S3 |
| Maximum Altitude | 2,000 m |
| Capacitance Tolerance | ±5% |
| Mounting | Any position |
| Can | Polypropylene with self-extinguishing features V2 (UL 94)<br>Noryl with self-extinguishing features VI (UL 94) for diameters > 50 mm |
| Disk | FASTON execution: Nylon PA66 with self-extinguishing features V0 |
| | Cable execution: PC-A with self-extinguishing features V0 |
| | For diameters > 40 mm cable execution: Noryl PPO with self-extinguishing features VI |
| Filling Resin | Epoxy |
| Dielectric | Polypropylene |
| Plates | Self-healing metal layer |
| Test Voltage Terminal to Terminal (VTT) | 2 $V_n$ for 2 seconds |
| Test Voltage Terminal to Can (VTC) | 2,000 V for 2 seconds |
| Air Distance Between Live Parts | ≥ 5 mm |
| Air Distance Between Live Parts and Case | ≥ 6 mm |

## Table 1 – Ratings & Part Number Reference

| Capacitance Value (µF) | VAC | Maximum Dimensions (mm) | | dV/dt (V/µs) | Termination | Packaging Quantity | Part Number |
|---|---|---|---|---|---|---|---|
| | | D | H | | | | |
| 2 | 470 | 25 | 55 | 20 | Unipolar flexible cable (tinned end) | 162 | C284ACA4200AL0J |
| 2.5 | 470 | 25 | 55 | 20 | Unipolar flexible cable (tinned end) | 162 | C284ACA4250AL0J |
| 3 | 470 | 25 | 55 | 20 | Unipolar flexible cable (tinned end) | 162 | C284ACA4300AL0J |
| 4 | 470 | 30 | 55 | 20 | Unipolar flexible cable (tinned end) | 110 | C284ACA4400AL0J |
| 5 | 470 | 30 | 55 | 20 | Unipolar flexible cable (tinned end) | 110 | C284ACA4500AL0J |
| 6 | 470 | 30 | 69.5 | 20 | Unipolar flexible cable (tinned end) | 110 | C284ACA4600AL2J |
| 3 | 470 | 25 | 55 | 20 | Unipolar rigid cable (tinned end) | 162 | C284ACR4300AL0J |
| 8 | 470 | 30 | 69.5 | 20 | Unipolar rigid cable (tinned end) | 110 | C284ACR4800AL2J |
| 10 | 470 | 35 | 69.5 | 20 | Unipolar rigid cable (tinned end) | 86 | C284ACR5100AL0J |
| **Capacitance Value (µF)** | **VAC** | **B (mm)** | **H (mm)** | **dV/dt (V/µs)** | **Termination** | **Packaging Quantity** | **Part Number** |

## Marking




(data): Manufacturing Plant, Date Code, Day of Production, Internal Mark

## Marking cont.

| Manufacturing Date Code (IEC–60062) | | | |
|---|---|---|---|
| **Year** | **Code** | **Month** | **Code** |
| 2020 | M | January | 1 |
| 2021 | N | February | 2 |
| 2022 | P | March | 3 |
| 2023 | R | April | 4 |
| 2024 | S | May | 5 |
| 2025 | T | June | 6 |
| 2026 | U | July | 7 |
| 2027 | V | August | 8 |
| 2028 | W | September | 9 |
| 2029 | X | October | O |
| 2030 | A | November | N |
| 2031 | B | December | D |
| 2032 | C | | |
| 2033 | D | | |
| 2034 | E | | |
| 2035 | F | | |
| 2036 | G | | |
| 2037 | H | | |
| 2038 | J | | |
| 2039 | K | | |
| 2040 | L | | |

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## Dissipation Factor

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

## Sealing

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

**Barometric Pressure**
The altitude at which hermetically sealed capacitors are operated controls the capacitor's voltage rating. 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. These effects can be in the form of capacitance changes, dielectric arc-over, and/or low insulation resistance. Altitude can also affect heat transfer. Heat that is generated in an operation cannot be dissipated properly, and high RI2 losses and eventual failure can result.

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