# Film capacitors – Power Electronic Capacitors

## PEC ModCap MF series (medium frequency)

| | |
|---|---|
| **Series/Type:** | **ModCap MF** |
| **Ordering code:** | **B25645A*** |
| Date: | August 2023 |
| Version: | 3.0 |

**Rated Capacitance: 350 … 3900 µF**
**Rated DC Voltage: 900 … 2300 V DC**

Construction A and B

## Construction

- Dielectric: 100% Bio-based Polypropylene film*
- Filling material: Non PCB, PU Resin (UL 94 V-0, Fire & smoke EN 45545-2 HL2 R22-HL3R23)
- Plastic case and cover (UL 94 V-0, Fire & smoke EN 45545-2HL2 R22-HL3R23)

## Features

- Modular design
- Self-healing technology
- Over-voltage capability
- Low ESL
- RoHS Compliant

## Typical applications

- DC link for renewable energy converters (solar, wind).
- DC link for traction applications (train, tramway, metro, light train inverters)
- DC link for industrial motor drive

## Reference Standards

- IEC 61071:2017, International Standard Capacitors for power electronics
- IEC 61881-1:2010, International Standard Railway Applications-Rolling stock equipment-Capacitors for power electronics
- EN 45545-2 HL3 R23, Fire safety standard

## Terminals

- Optimized low inductance flat female terminals M6

## Certifications

- UL Recognized
- ISCC certification with 100% Bio-based PP film *

## Packing

- Construction A: 4 capacitors per box
- Construction B: 3 capacitors per box

* (Mass balance approach)

## Technical data and specifications

| Characteristics | |
|---|---|
| Rated capacitance $C_N$ | Up to 3900 µF (see table) |
| Tolerance | K (±10%) |
| Rated voltage $U_N$ | 900 to 2300 V DC (see table) |
| Ripple voltage $U_r$ | Up to 424 $V_{peak\text{-}peak}$ |
| Operation bandwidth [1)] | Up to 50 kHz |
| Nominal current $I_N$ (1 kHz) | (see table) |
| Inductance ESL (1 MHz) | 14 nH |
| Thermal Resistance, $R_{th}$ [2)] | Construction A: 1.4 K/W<br>Construction B: 1 K/W |

[1)] RMS current value that corresponds to components above 50 kHz limited to 10% of total RMS. Maximum continuous losses defined for rated current at 1 kHz should not be exceed. ESR vs frequency graphs available in page 5 for losses calculation according to a specific current spectrum. For more accurate thermal calculation, please ask for FEA simulation according to your specific operation conditions.

[2)] Calculated from $T_{amb}$ to $T_{HS}$ considering natural convection and no transfer of heat through the terminals. For more accurate thermal calculation, please ask for FEA simulation according to your specific operation conditions.

| Maximum ratings | |
|---|---|
| Maximum permissible voltage ($U_{max}$) | $U_N$ +10% (30 % of on-load daily duration)<br>$U_N$ +15% (up to 30 min daily)<br>$U_N$ +20% (up to 5 min daily)<br>$U_N$ +30% (up to 1 min daily) |
| Maximum permissible peak voltage | $U_N$ +50% for 30 ms is permitted 1000 times during the lifetime of the capacitors |
| $U_{TC}$ (Isolation)<br>$U_{TC}$ (Extinction) | 5 kV<br>3 kV (<10 pC) |

The average applied voltage shall not be higher than the specified voltage.
It should be recognised that any significant period of operation at voltages above the rated one would reduce lifetime.

| Test data | |
|---|---|
| Voltage Test between terminals ($U_{TT}$) | 1.5 • $U_N$, DC, 10 s (room temperature) |

| Design data | |
|---|---|
| Weight approx. | 3.7 kg (construction A), 6.1 kg (construction B) |
| Fixing | 4 x Ø 6.5 mm |

| Terminals | |
|---|---|
| Terminations | 4 x M6 x 25 x 30 mm, contact area 60 $mm^2$ |
| Max. torque | 6 Nm |

| Climatic category 40/75/56 | |
|---|---|
| Θ min | –40 ºC |
| Θ max | +75 ºC |
| Storage temperature | –40 …+85 ºC |
| $\Theta_{hotspot}$ max. | +90 ºC |
| Humidity | av. rel. <93%, 25 $g/m^3$ max. |
| Time test | 56 days |
| Maximum altitude | 2000 m, higher altitude upon request |

| Life expectancy | |
|---|---|
| Lifetime *) | Up to 200 000 h (*)<br>Up to 65 000 h (**) |
| End of life criteria | C-loss: 3% |

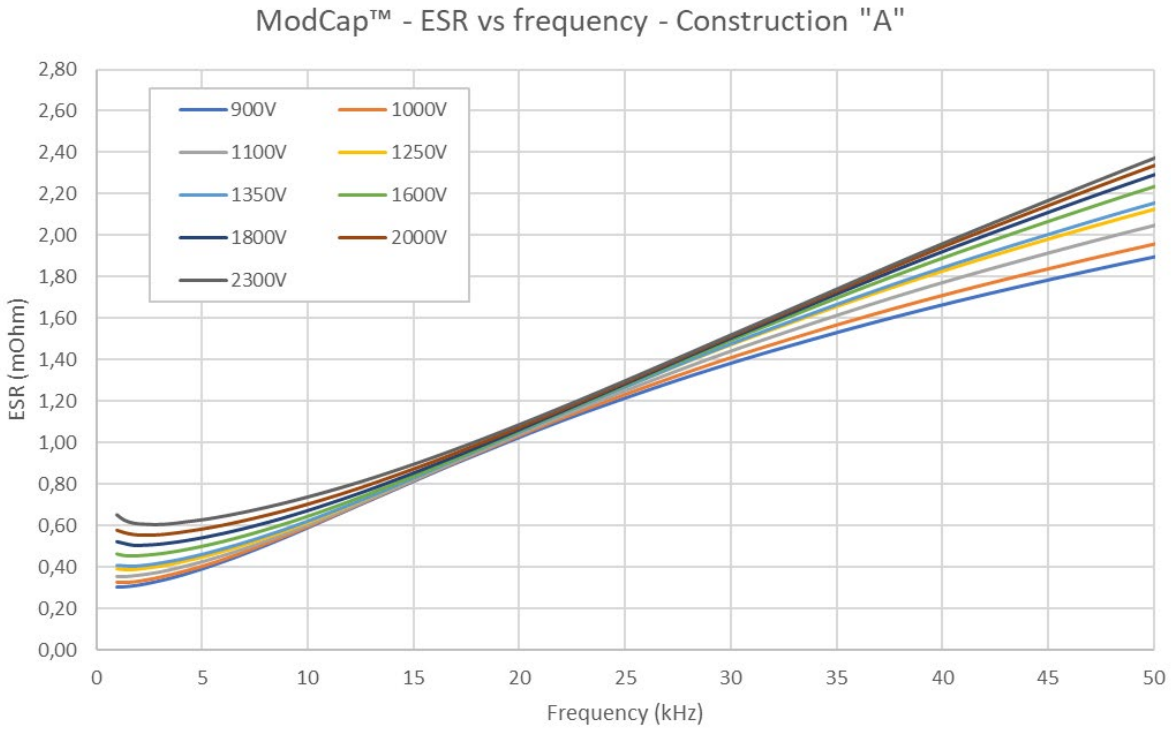
(*) $U_N$, $I_N$ and 70 ºC $T_{amb}$ (80 ºC mean dielectric temperature)

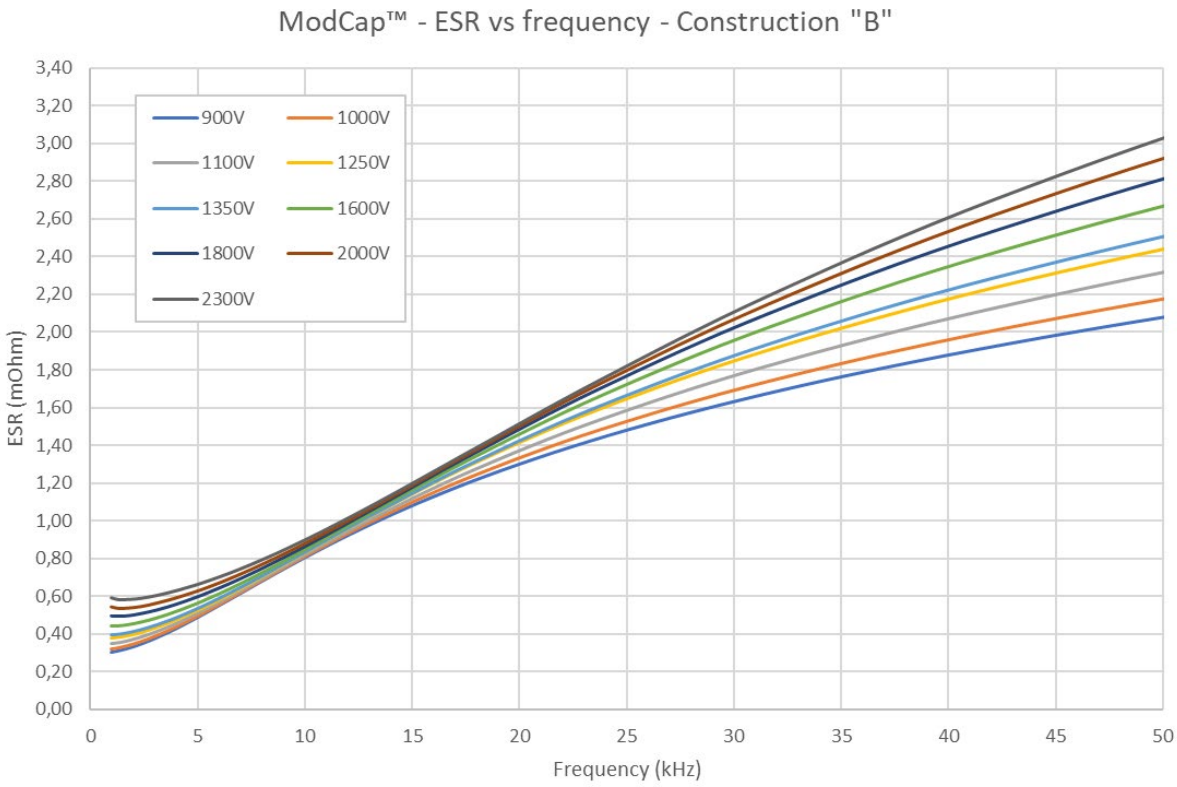
(**) $U_N$, $I_N$ and 80 ºC $T_{amb}$ (90 ºC mean dielectric temperature)

## Ordering codes

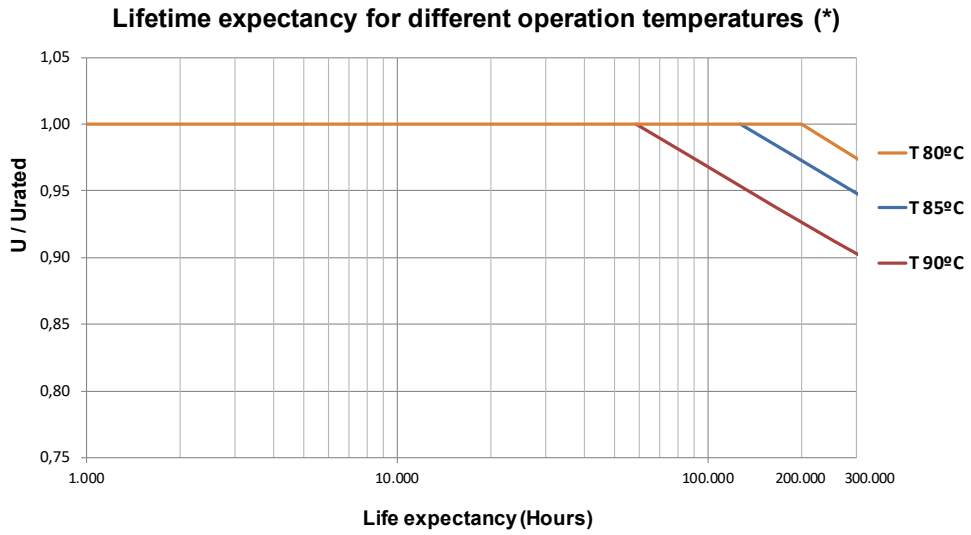
| $U_N$ V DC | $C_N$ µF | $I_N$ A | $I_S$ kA | Î kA | Dimensions LxWxH mm | Design / PU | Ordering code |
|---|---|---|---|---|---|---|---|
| 900 | 2050 | 200 | 225 | 5 | 205x90x170 | A / 4pcs | B25645A9218K003 |
| | 3900 | 155 | 250 | 5 | 220x115x215 | B / 3pcs | B25645A9398K003 |
| 1000 | 1700 | 190 | 220 | 5 | 205x90x170 | A / 4pcs | B25645A1178K003 |
| | 3210 | 150 | 245 | 5 | 220x115x215 | B / 3pcs | B25645A1328K003 |
| 1100 | 1330 | 180 | 215 | 5 | 205x90x170 | A / 4pcs | B25645A1138K003 |
| | 2525 | 140 | 240 | 5 | 220x115x215 | B / 3pcs | B25645A1258K003 |
| 1250 | 1050 | 170 | 210 | 5 | 205x90x170 | A / 4pcs | B25645A1118K003 |
| | 1985 | 135 | 235 | 5 | 220x115x215 | B / 3pcs | B25645A1198K003 |
| 1350 | 980 | 160 | 205 | 5 | 205x90x170 | A / 4pcs | B25645A1108K013 |
| | 1865 | 130 | 230 | 5 | 220x115x215 | B / 3pcs | B25645A1188K003 |
| 1600 | 720 | 150 | 200 | 5 | 205x90x170 | A / 4pcs | B25645A1757K003 |
| | 1375 | 120 | 225 | 5 | 220x115x215 | B / 3pcs | B25645A1138K013 |
| 1800 | 535 | 140 | 175 | 5 | 205x90x170 | A / 4pcs | B25645A1567K003 |
| | 1025 | 115 | 220 | 5 | 220x115x215 | B / 3pcs | B25645A1108K003 |
| 2000 | 430 | 130 | 155 | 5 | 205x90x170 | A / 4pcs | B25645A2447K003 |
| | 820 | 110 | 210 | 5 | 220x115x215 | B / 3pcs | B25645A2827K003 |
| 2300 | 350 | 120 | 140 | 5 | 205x90x170 | A / 4pcs | B25645A2367K003 |
| | 670 | 105 | 200 | 5 | 220x115x215 | B / 3pcs | B25645A2677K003 |

## ESR vs frequency



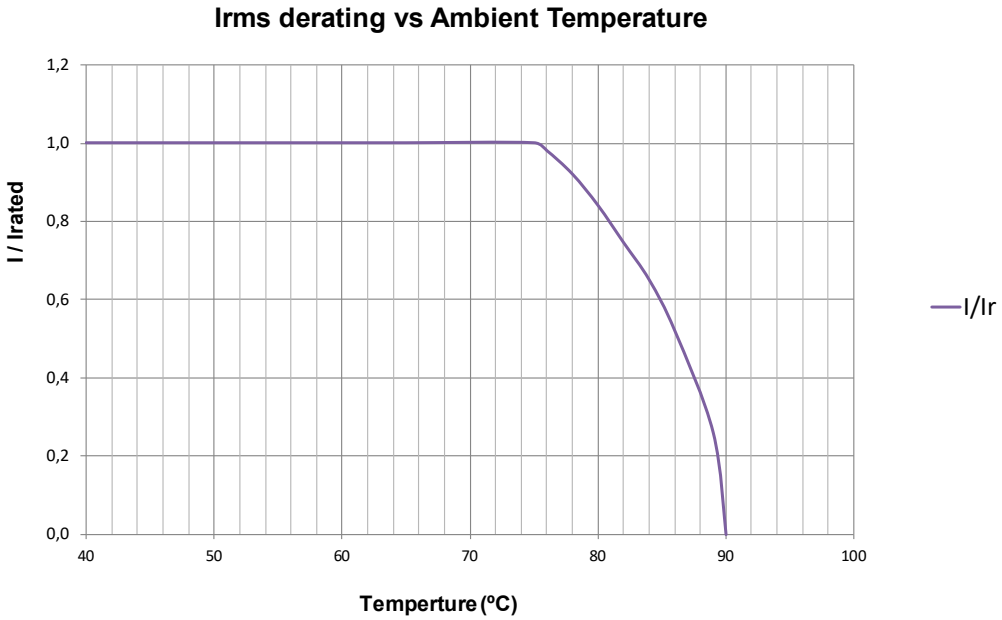



## Lifetime expectancy



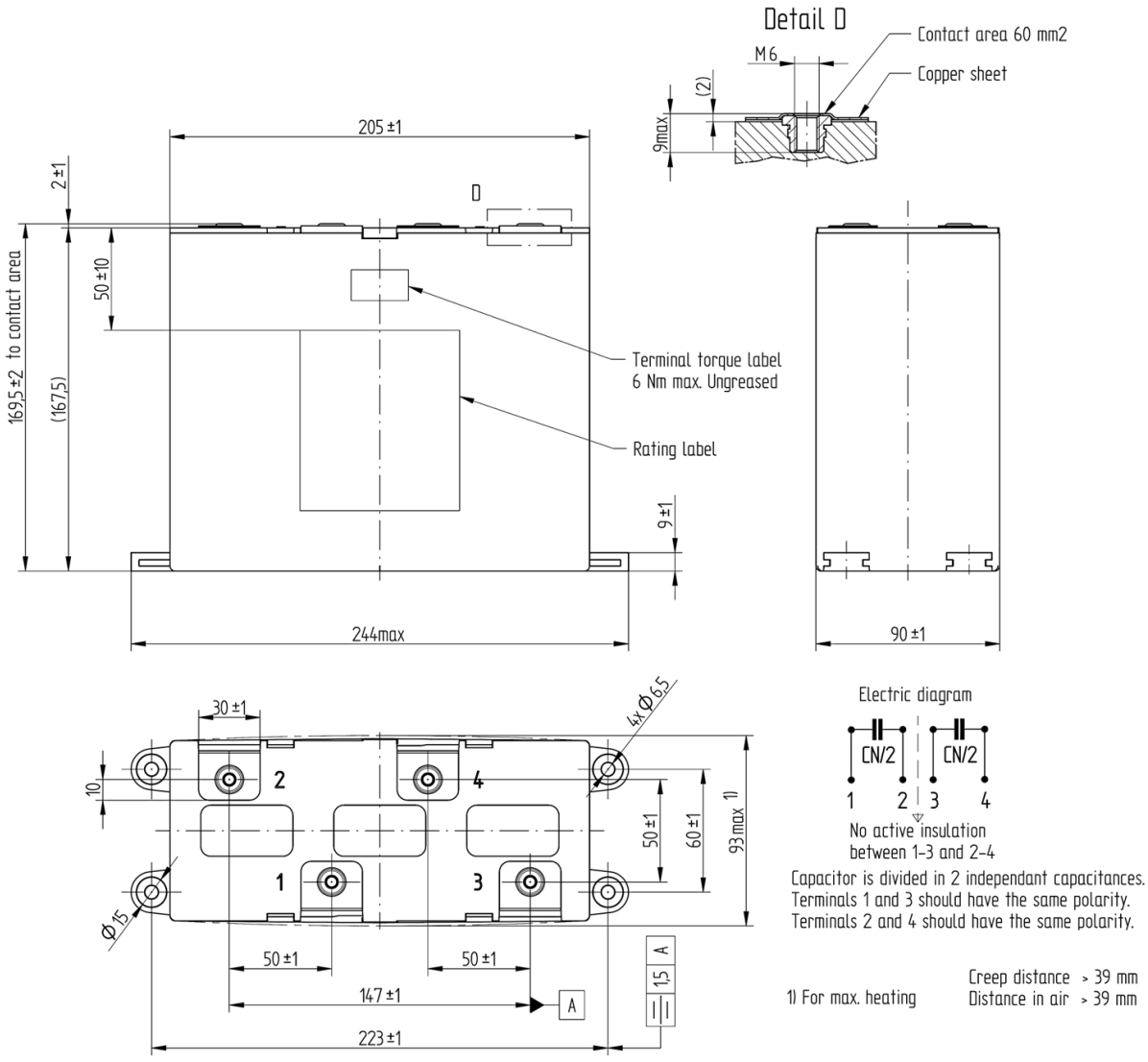

**(*) Homogeneous dielectric temperatures**

## Derating vs temperature



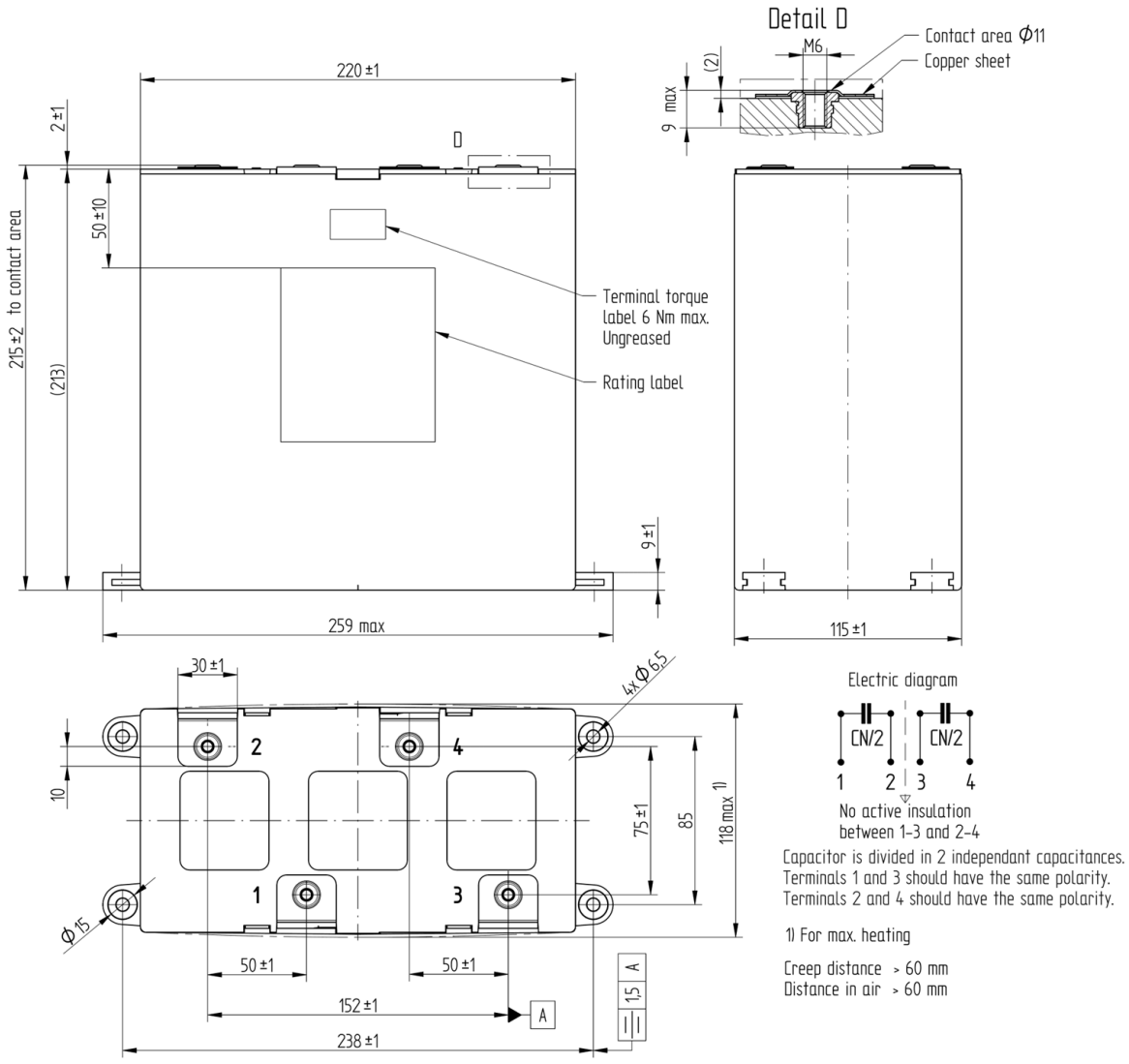
## Dimensional drawing

### Construction A



## Dimensional drawing

### Construction B



## General safety recommendations

When employed in power electronics applications, the capacitors run with high energy and high currents.

The energy stored in capacitors may be lethal. To prevent any risks of shocks, the capacitor should be discharged with adequate means by qualified people and short-circuited between terminals before handling.

The capacitor can contain dangerous residual charges even after long time without operation. For this reason, the electrical terminals must remain short-circuited until the capacitors are connected in the operating circuit.

TDK Electronics cannot predict all possible stresses that a power electronic capacitors can be subjected to. There is a remaining probability of power electronic capacitors showing malfunction due to excess temperature, overvoltage, wrong application, wrong installation, faulty maintenance, mechanical damage, operation at the limits of the specification or other reasons.

### Transportation and handling

- The electrical terminals must not be used for grabbing or suspending the capacitor during transportation and handling.
- Do not handle the capacitor before it is discharged.
- Handle capacitors carefully, because they may still be charged even after disconnection due to faulty discharging devices.
- Protect the capacitor properly against over current and short circuit.
- Failure to follow cautions may result, worst case, in premature failures, bursting and fire.
- Capacitors >1500V are subjected to Dual Use Category 3A201.

### Fixing

- The threaded screw 4x Ø 6.5 mm in the bottom of the capacitor has to be used for fixing.

### Storage and operating conditions

Capacitors must never be stored outside the specified temperature and humidity ranges.
Capacitors may not be stored in corrosive atmospheres, particularly not when chlorides, sulfides, acids, alkalis, salts, organic solvents, or similar substances are present.

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## Important notes

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Release 2023-07