ESTAdry DC Capacitor
DCMKP 3.0 kV, 2.1 mF/C

NOMINAL RATINGS

Capacitance / tolerance	C_N	2100 µF ± 7 %
Rated DC voltage	U_{NDC}	3000 V_{DC}

OVER VOLTAGES ACCORDING TO STANDARD

1.1 x U_{NDC}	U_1	3300 V (30 % of on-load duration)
1.15 x U_{NDC}	U_2	3450 V (30 min/day)
1.2 x U_{NDC}	U_3	3600 V (5 min/day)
1.3 x U_{NDC}	U_4	3900 V (1 min/day)
1.5 x U_{NDC}	U_5	4500 V (30 ms; max. 1000 x per lifetime)

CHARACTERISTICS

Maximum current	$I_{max.}$	330 A_{RMS}
Maximum peak current	$\hat{I}$	41 kA
Maximum surge current	$\hat{I}_S$	123 kA (100 x per lifetime)
Series resistance (1)	R_S	< 0.17 mΩ
Thermal resistance (1) (hotspot ambient)	R_{th}	0.44 K/W
Dielectric loss factor	tan_d	2 x 10^{-4}
Self inductance (1)	L_S	< 100 nH

TEST VOLTAGES (ROUTINE TEST)

Terminal / terminal	$U_{T/T}$	4500 V_{DC}, 10 s
Terminal / casting	$U_{T/C}$	5240 V_{AC}, 10 s

OPERATING TEMPERATURE

Lowest operating temp.	$\theta_{min.}$	-40 °C
Max. operating temp.	$\theta_{max.}$	+50 °C
Max. hotspot temp.	$\theta_{hotspot}$	+85 °C

STORAGE TEMPERATURE

Minimum temperature	$T_{min.}$	-40 °C
Maximum temperature	$T_{max.}$	+85 °C

TECHNOLOGY

Dielectric	Metallized polypropylene, self-healing
Filling material	Resin, dry
Safety device	Overpressure valve, unprotected

BUSHINGS D-242

Amount	6
Flash over distance T/C	38 mm
Creepage distance T/C	61 mm
Terminal	M8
Max. tightening torque	10 Nm
Height	22 mm

MECHANICAL DATA

Dimensions	415 mm x 345 mm x 295 mm
Drawing	76956-01-A1
Weight (1)	47 kg
Casing material	Aluminum
Painting	None
Mounting position	Every position

LIFE EXPECTANCY (2)

> 100 000 h

FAILURE RATE

< 200 FIT

STANDARD

IEC 61071

SPECIFICATION

Part / SAP no.	5192-76956

DUAL USE

AL/ECCN = NO/EAR99

Notes

- **SAFETY REMARK - please follow this link for ZVEI Safety Instructions: https://www.zvei.org/en/press-media/publications/general-safety-recommendations-for-power-capacitors/**

(1) Calculated value; to be verified by measurement

(2) At the following conditions: U_{NDC}, $I_{max.}$, $\theta_{max.}$ unless otherwise mentioned

TERMS AND DEFINITIONS ACCORDING TO CHAPTER 3 OF IEC 61071-2017-08

Rated DC Voltage, U_{NDC}

Maximum operating peak voltage of either polarity but of a non-reversing type waveform, for which the capacitor has been designed, for continuous operation. Damping capacitors, for gate turn-off thyristor (GTO) can be regarded as DC capacitors with a ripple voltage equal to the rated DC voltage $U_{NDC} = U_r$.

Ripple Voltage, U_r

Peak-to-peak alternating component of the unidirectional voltage.

Maximum Peak Current, $\hat{I}$

Maximum peak current that can occur during continuous operation.

Maximum Current, $I_{max.}$

Maximum RMS current for continuous operation.

Maximum Surge Current, $\hat{I}_s$

Peak non-repetitive current induced by switching or any other disturbance of the system which is allowed for a limited number of times, for durations shorter than the basic period.

Series Resistance, R_S

Effective ohmic resistance of the conductors of a capacitor under specified operating conditions.

Tangent of the Loss Angle of a Capacitor, tan δ

Ratio between the equivalent series resistance and the capacitive reactance of a capacitor at a specified sinusoidal alternating voltage, frequency, and temperature.

$$\tan \delta = R_{esr}\, \omega C = \tan_d + R_S\, \omega C$$

$\tan_d$ = dielectric loss factor

Equivalent Series Resistance of a Capacitor, R_{esr}

Effective resistance which, if connected in series with an ideal capacitor of capacitance value equal to that of the capacitor in question, would have a power loss equal to active power dissipated in that capacitor under specified operating conditions.

Lowest Operating Temperature, $\theta_{min.}$

Lowest temperature at which the capacitor may be energized.

Maximum Operating Temperature, $\theta_{max.}$

Highest temperature of the case at which the capacitor may be operated.

CALCULATION OF HOTSPOT TEMPERATURE

The limits for ripple voltage U_r and current I at a given application are dependent on the hotspot temperature T_{HS} inside capacitor. T_{HS} is influenced by the ambient temperature T_{amb} and the losses of the capacitor P.

It can be calculated as follows:

$$P = U^2_{r,\,RMS} \times 2\pi \times f_{ripple} \times C_N \times \tan_d + I^2 \times R_S$$

$$T_{HS} = T_{amb} + R_{th} \times P$$

P	Losses in W
$U_{r,\,RMS}$	Effective ripple voltage in V_{RMS}
I	Total effective current (including all harmonics) in A_{RMS}
f_{ripple}	Ripple frequency in Hz
C_N	Capacitance in F
$\tan_d$	Dielectric loss factor
R_S	Series resistance of the capacitor in Ω
R_{th}	Thermal resistance between the hotspot in the capacitor and still ambient air in K/W
T_{amb}	Ambient temperature in °C
T_{HS}	Hotspot temperature in °C

ESTA STANDARD RELIABILITY DISCLAIMER AND GENERAL INFORMATION

The diagram below shows the generalized relationship between maximum allowable power loss level and ambient air temperature. The operating power losses must be derated at temperatures above $\theta_{max.}$. The lifetime of polypropylene film capacitors is dependent on the temperature of the dielectric. Operating film capacitors at the maximum temperature and maximum power loss level for extended periods will impact their lifetime.

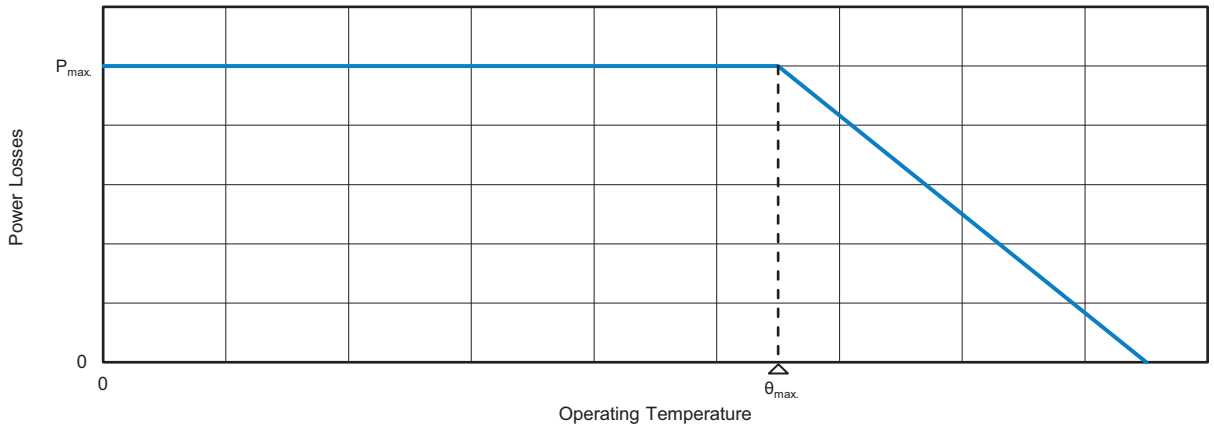

Fig. 1 - Allowable power losses as a function of ambient temperature, $P_{max.}$ is the power loss at I_N and f_N, whereas $\theta_{max.}$ is the maximum temperature at which losses equal to $P_{max.}$ are allowed

PLEASE NOTE

Statements about lifetime / life expectancy are based on calculations which are based on internal tests again. They have to be understood exclusively as estimations. Also due to external factors, the lifetime / life expectancy in the field application may deviate from the calculated lifetime / life expectancy. In general, nothing stated herein shall be construed as a guarantee of quality or durability.

If not defined otherwise in this document, failure due to end of life (EOL) is indicated by capacitance change $|\Delta C/C| > 3$ %; whereas C describes the initial value measured during routine test.