



## Polypropylene Film Capacitors Modules

### Features

- Customer Specific Designs
- High ripple current capability
- Self-healing
- Long lifetime
- Metal Case, fire retardant resin
- RoHS compliant (2011/65/EU)



### Applications

- High power frequency converters
- Electric and hybrid electric vehicles, Traction and Trains

Item	Characteristics
<b>Climatic Category</b>	40/85/56 (IEC 61071)
<b>Operating Temperature</b>	-40 ~ +85 °C ( $\theta_{\text{hotspot}} \leq 85 \text{ °C}$ )
<b>Storage Temperature</b>	-40 ~ +85 °C
<b>Rated Voltage <math>U_{RDC}</math></b>	750 ~ 3000V <sub>DC</sub>
<b>Capacitance Range</b>	500 ~ 4.000 $\mu\text{F}$
<b>Capacitance Tolerance</b>	$\pm 10 \%$ (K), $\pm 5 \%$ (J)
<b>Voltage between Terminals <math>U_{TT}</math></b>	$1,5 * U_{RDC}$ (20 °C, 10 s)
<b>Voltage between Terminals and Case <math>U_{TC}</math></b>	3000 V <sub>AC</sub> (20 °C, 50 Hz, 10 s)
<b>Max. Overvoltage</b>	$1,1 * U_{RDC}$ (30 % of time under load)
	$1,15 * U_{RDC}$ (30 min. per day)
	$1,2 * U_{RDC}$ (5 min. per day)
	$1,3 * U_{RDC}$ (1 min. per day)
	$1,5 * U_{RDC}$ (max. 30 ms, 100ms per day)
<b>Insulation Resistance <math>R_i * C</math></b>	$\geq 5.000 \text{ M}\Omega * \mu\text{F}$ (20 °C, 100 V <sub>DC</sub> , 1 min)
<b>Dielectric Dissipation Factor <math>\tan \delta_o</math></b>	$\tan \delta_o \leq 2 * 10^{-4}$ (20 °C, 100 Hz)
<b>Life Time Expectancy</b>	$\geq 100.000 \text{ h}$ , failure rate $\leq 100 \text{ FIT}$ ( $\theta_{\text{hotspot}} \leq 70 \text{ °C}$ , $U_{RDC}$ )
<b>Reference Standard</b>	IEC 61071:2007, REACH, RoHS

### Ratings (Proposals) for CBB 133 DM Series

$U_R$ (V)	$C_R$ ( $\mu\text{F}$ )	$\hat{I}^{(1)}$ (A)	$R_s^{(2)}$ (m $\Omega$ )	$I_{\text{max}}^{(3)}$ 60 °C (A)	$L_s$ (nH)	$W$ $\pm 1.0$ (mm)	$H$ $\pm 1.0$ (mm)	$T$ $\pm 1.0$ (mm)	Example	Ordering Code
750V <sub>DC</sub> Q3	2800	2200	0,8	80	80	240	103	125	Drawing 1	FCSQ3DM228*A053*71E3
	3800	3800	0,6	80	80	490	110	84	Drawing 2	FCSQ3DM388*A039081E3
800V <sub>DC</sub> 2K	2500	3500	0,6	250	50	190	195	170	Drawing 3	FCS2KDM258*A019081E3
	2500	3500	0,4	300	40	402	116	110	Drawing 4	FCS2KDM258*B098021E3
3000V <sub>DC</sub> 3F	1500	4000	1,0	150	100	340	360	230	Drawing 5	FCS3FDM158*A0137E1E3

(1) Maximum permissible peak current



(2) Series resistance at 20°C ambient temperature at 10kHz

(3) Maximum permissible r.m.s. ripple current at 10kHz

\*\*\* to be defined, see ordering code table  
Customized products are available on request

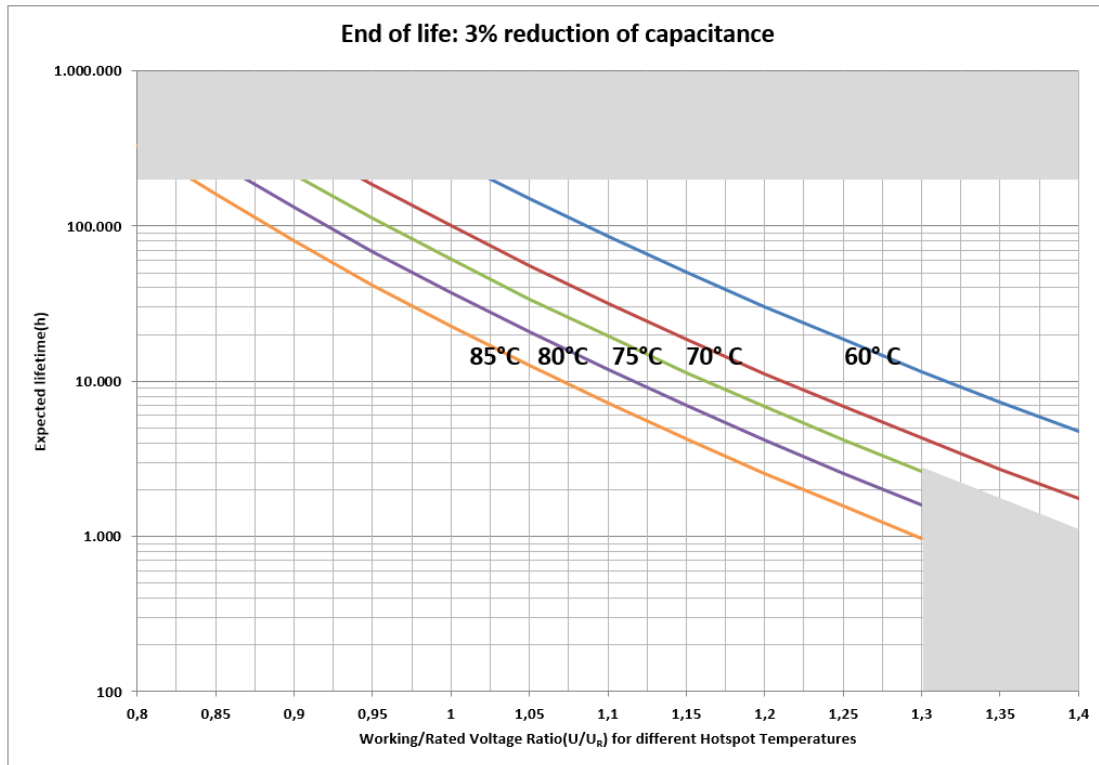


## Marking (Example)

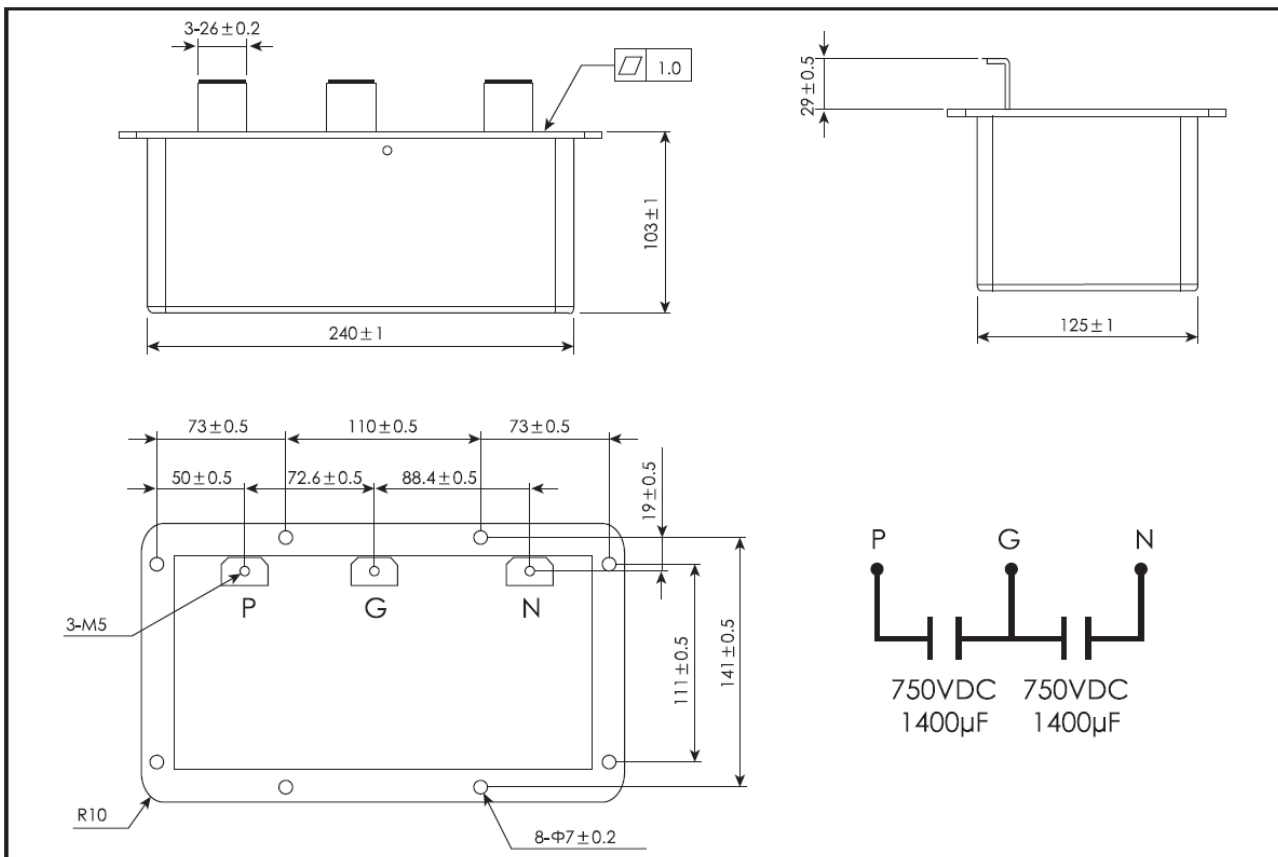
	—	1
CBB133	—	2
2500 $\mu$ F $\pm$ 10%	—	3
U <sub>R</sub> = 800VDC SH	—	4
U <sub>TC</sub> = 3000V 50/60Hz	—	5
-40~+85°C IEC61071	—	6
Discharge before handling	—	7
J35F23104 	—	8

No.	Item
1	Brand
2	Series Designation
3	Capacitance and Tolerance
4	U <sub>R</sub> Rated Voltage
5	U <sub>TC</sub> Voltage between Terminals and Case, Frequency
6	Temperature Range, Reference Standard
7	Safety Warning
8	Date Code

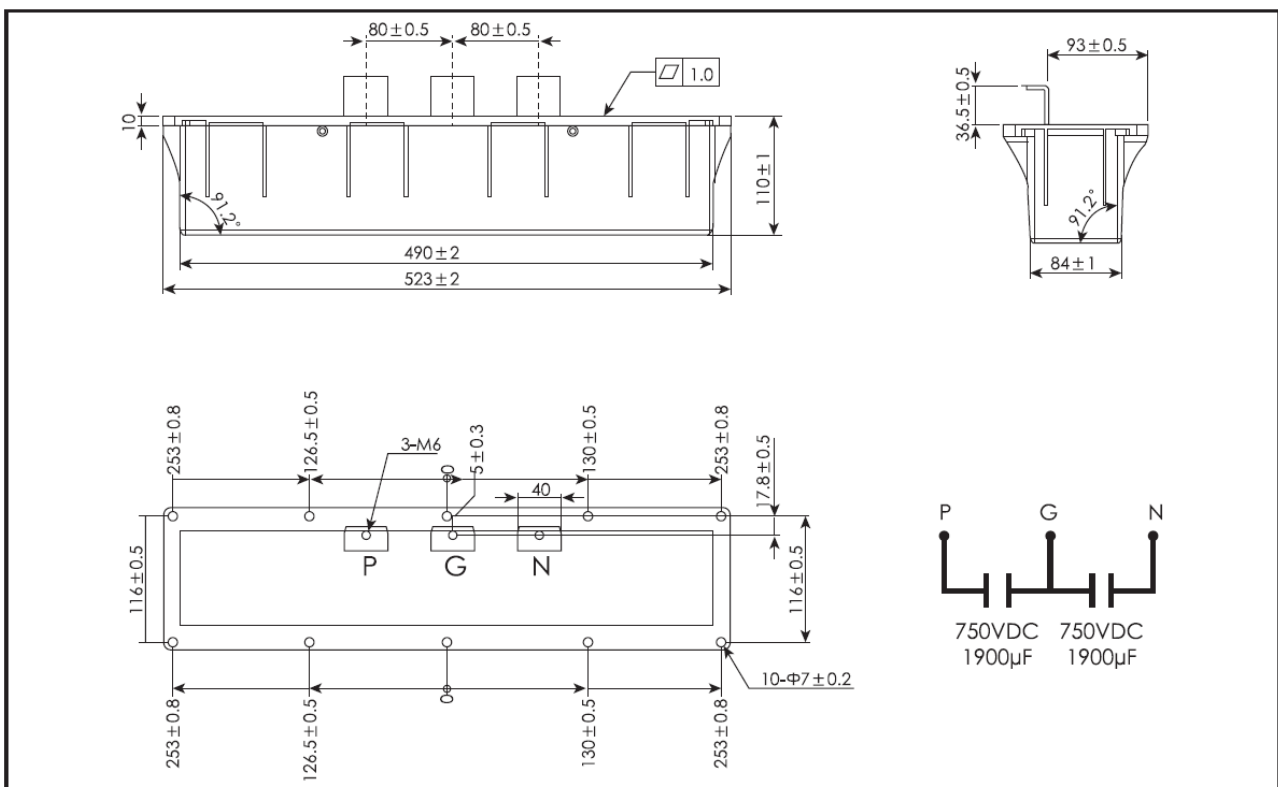
## Life Time Expectancy



## Example Drawing #1

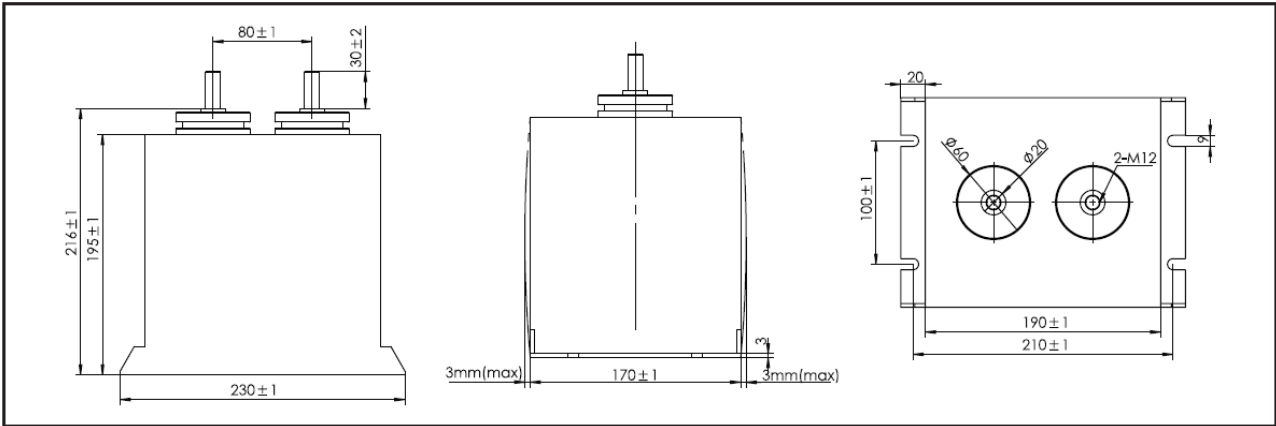


## Example Drawing #2

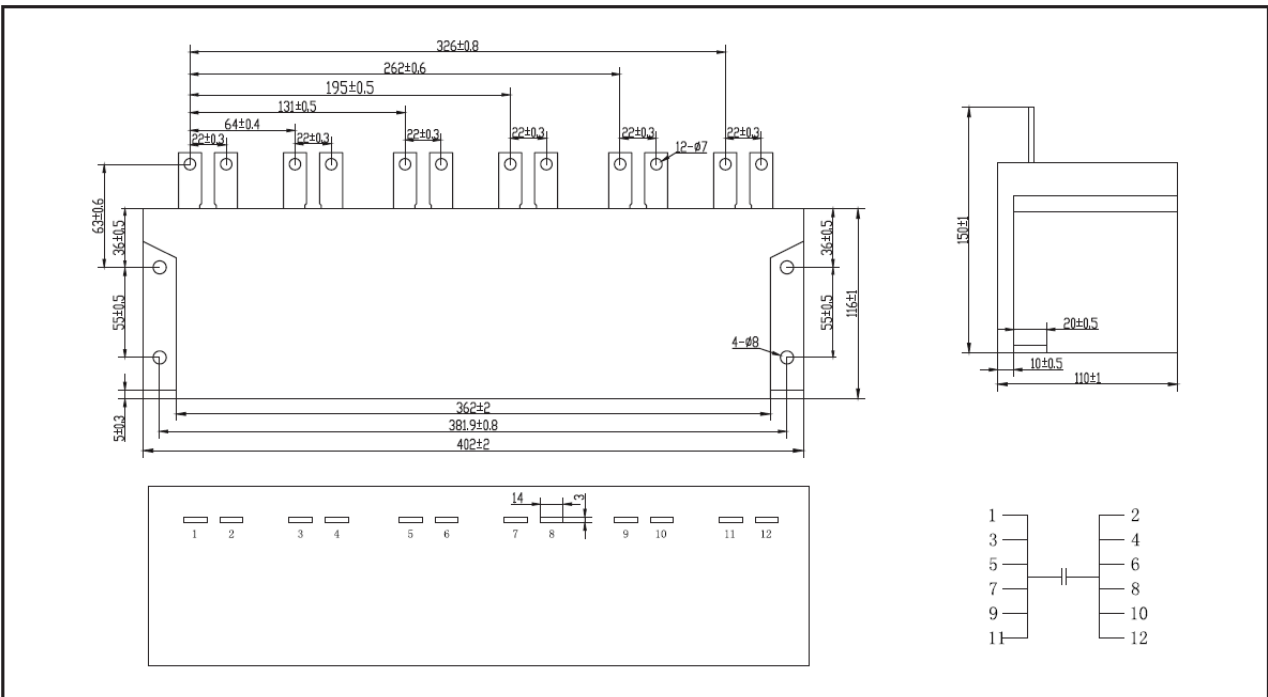




## Example Drawing #3

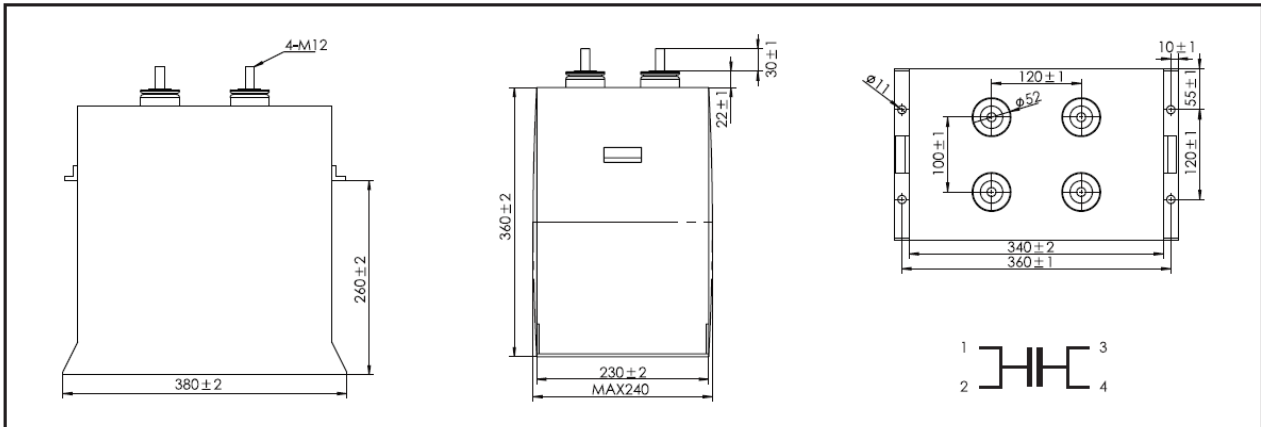


## Example Drawing #4





## Example Drawing #5



## Ordering Code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
FC		S	2W		DV		117			K	B	0	1	0	0	2	1	E	3
Capacitor type	Product shape	DC rated voltage code (V)	Series code	Capacitance code examples	Capacitance tolerance	Dimension Code W x H x T				Terminal	Terminal Pitch	Mounting Hole	For internal use						
Film cap. = FC	square = S	750 = Q3 800 = 2K 3000 = 3F	CBB133 = DM	1500 = 158 2800 = 288	±5% = J ±10% = K	190 x 195 x 170 = A019 340 x 360 x 230 = A013 other on request				Female M6 = 0 Male M6 = 1 Female M8 = 2 Male M12 = 7	80 = 8 160 = A 100 = B 72 = 7 120 = E	Without = 0 With = 1							

For design requests please kindly contact your local sales office.

## Jianghai Film Capacitors

**Warranty:** The information contained in this datasheet does neither form part of any quotation nor of a contract, it is believed to be accurate, reliable and up to date. Quality data are based on the statistical evaluations of a large quantity of parts and do not constitute a guarantee in a legal sense. However, agreement on these specifications does mean that the customer may claim for replacement of individual defective capacitors within the terms of delivery. We cannot assume any liability beyond the replacement of defective components. This applies in particular to any further consequences of component failure. Furthermore it must be taken into consideration that the figures stated for lifetime, failure rates and outlier percentages refer to the average production status and are therefore to be understood as mean values (statistical expectations) for a large number of delivery lots of identical capacitors. These figures are based on application experience and data obtained from preceding tests under normal conditions, or – for purpose of accelerated aging – more severe conditions. JIANGHAI reserves the right to change these specifications without prior notice. Any application information given is advisory and does not form part of any specification. The products are not primarily designed for use in life supporting applications, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. JIANGHAI customers using or selling these products for use in such applications without prior written consent of JIANGHAI do so at their own risk and agree fully to indemnify JIANGHAI for any damage resulting from such improper use or sale. This version of the datasheet supersedes all previous versions.

**Rated Voltage  $U_R$ :** Rated Voltage is the maximum operating peak voltage of either polarity but of a non-reversing type waveform, for which the capacitor has been designed, for continuous operation. The Rated Voltage is marked on the capacitor and defined in the datasheets as  $U_R$ .

**Operating voltage:** The plastic film capacitor varies in the maximum applicable voltage depending on the applied voltage waveform, current waveform, frequency, ambient temperature (capacitor surface temperature), capacitance value, etc. Be sure to use capacitors within the specified values by checking the voltage waveform, current waveform, and frequency applied to them (In the application of high frequency, the permissible voltage varies with the type of the capacitor. Refer to the specification for details.)

**Non-recurrent surge voltage  $U_s$ :** Peak voltage induced by a switching or any other disturbance of the system which is allowed for a limited number of times and for durations shorter than the basic period.  
 - Maximum duration: 50 ms / pulse  
 - Maximum number of occurrences: 1000 (during load)

**Maximum rate of voltage rise  $dV/dt$ :** Maximum permissible repetitive rate of voltage rise of the operational voltage.

**Charging and discharging:** Because the charging and discharging current of capacitor is obtained by the product of voltage rise rate ( $dV/dt$ ) and capacitance, low voltage charging and discharging may also cause deterioration of capacitor such as shorting and open due to sudden charging and discharging current. When charging and discharging, pass through a resistance of  $20\Omega/V$  to  $1000\Omega/V$  or more to limit the current.

When connecting multiple film capacitors in parallel in withstand voltage test or life test, connect a resistance of  $20\Omega/V$  to  $1000\Omega/V$  or more in series to each capacitor (For detail see the specification). In addition, capacitors must be discharged via a resistor before handling. Because the capacitors do not have any discharge resistors built-in, there is a risk of residual voltages and electric energy contents that maybe dangerous.

**Operating Current:** The pulse (or AC) current flowing through the capacitor is expressed as:  $I = C \times dV/dt$ . Due to the fact that the dissipation factor of the capacitor is greater than zero, heat will be generated in any application where alternating currents or pulses occur. The resulting internal temperature rise may cause a severe deterioration of the capacitor's withstanding voltage, or may lead to a breakdown (even smoke or fire may result). Therefore, the safe use of capacitor must be within the rated voltage (or category voltage) and the permissible current ranges. The rated current must be considered by dividing into pulse current (peak current) and continuous current (rms current) depending on the break down mode, and when using, should make sure the both currents are within the permissible range.

**Temperature range:** Use film capacitors only within the specified operating temperature range.

**Expected lifetime:** The expected lifetime of the capacitor depends on the applied voltage and the hot spot temperature during operation. For capacitors applied in different situations, the obtainable average service lives are different. The capacitors used in DC-Link circuits will have an expected lifetime of approximately 100000 hours at rated voltage and  $70^\circ\text{C}$  hot spot temperature.

**Insulation voltage  $U_i$ :** rms value of AC voltage designed for the insulation between terminals of the capacitor to case or earth. The insulation voltage is equal to the rated voltage of the capacitor, divided by  $\sqrt{2}$ , unless otherwise specified.

**Voltage between terminals  $U_{TT}$ :** Voltage between terminals (at  $20^\circ\text{C}$ , 10s):  $1.5 \times U_{RDC}$

**Voltage between terminals and case  $U_{TC}$ :** Voltage between terminals and case (at  $20^\circ\text{C}$ , 10s):  $2 \times U_i + 1000$  or  $3000 (V_{AC})$ , whichever value is larger.

**Buzzing noise:** Any buzzing noise produced by a capacitor is caused by the vibration of the film due to the Coulomb force that is generated between the electrodes with opposite poles. If the wave-form with a high distortion rate or frequency is applied across the capacitor, the buzzing noise will become louder. But the buzzing noise is of no harm to the capacitor.

**Surface over temperature  $\Delta \theta$  case:** When current continuously flow through the capacitor, the temperature inside the capacitor will rise induced by dissipated heat. If the temperature exceeds the maximum allowed hot-spot temperature, it might cause a short circuit or fire. The limits described in the catalogue must not be exceeded and it's necessary to check the temperature on the capacitor's surface in operation.

**Flame retardation:** Although flame retarding PU resin or plastic case material is used in the coating or encapsulation of plastic film capacitors, continuous exposure to high temperature ambient or fire will break the coating layer or plastic case of the capacitor, and may lead to melting and ignition of the capacitor element.

**Humid ambient:** If used for a long time in a humid ambient, the capacitor might absorb humidity and oxidize the electrodes causing damage to the capacitor. In case of AC application, high humidity would increase the corona effect. This phenomenon causes a drop in capacitance and an increase of capacitor losses.

### Storage conditions:

- 1) Capacitors must not be stored in corrosive atmospheres, particularly not when chlorides, sulfides, acids, lye, salts, organic solvents or similar substances are present.
- 2) It must not be stored in high temperature and/or high humidity environments. The following storage conditions must be kept (applicable only for storage in the original package):  
 Temperature:  $\leq 35^\circ\text{C}$   
 Humidity:  $\leq 80\% \text{ RH}$ , no dew allowed on the capacitor.  
 Storage time:  $\leq 24$  months (from the date marked on the capacitor's body or on the label sticking to the package)

**Mounting:** Other devices, which are mounted near the capacitor, should not touch the capacitor. Additional heat coming from other components near the capacitor may reduce the lifetime of the capacitor. Do never attempt to bend or twist the capacitor after mounting and avoid any mechanical stress on the terminals. Never exceed the max. permissible torques when tightening the terminal screws or the mounting bolt's cap nuts.

**Caution during use of Capacitors:** Do not touch the terminals of capacitors. Keep the capacitor free from conductive solution, such as acids, alkali and so on. Ensure that the operating environment of the equipment into which the capacitor has been built is within the specified conditions mentioned in the catalogue or specification sheets.

**Definition of electrical parameters:** Separate documents as application notes, equivalent circuit diagrams and so on are available on request.

**Packaging:** Please refer to the data book for details. Further information is available on request.