Voltage

The various voltage terminologies are shown in figure 6.

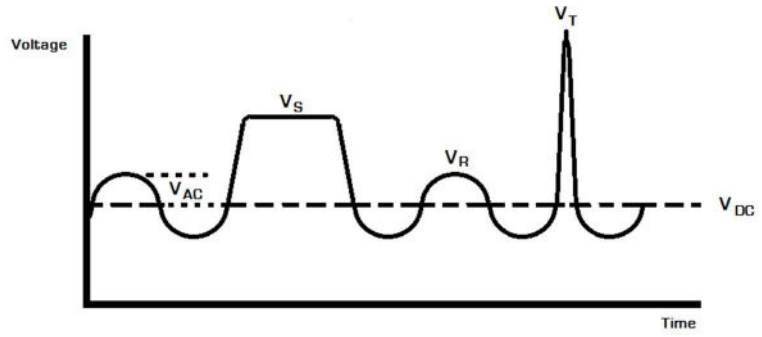

Figure 6

V_R is the rated voltage of the capacitor. The maximum peak voltage of any ripple voltage component must not exceed the rated voltage.
V_{DC} is the mean value of the applied DC voltage.
V_{AC} is the maximum superimposed ripple voltage.
V_S is the surge voltage. A surge voltage is caused by disturbances, such as switching and the values are stated for each capacitor range. The limitations are a maximum of 1000 random occurrences during the life of the capacitor with a load period of 30s and no load period of 330s. The RC time constant equals 0.1s.
V_T is the transient voltage. Transients are application specific are there are no stated values. However, a typical transient could have a rise time ranging from a few hundred µs to several ms. Contact Itelcond if your application involves transients.

Reverse voltage not exceeding 1.5 Volts may be applied to the capacitors without significant change in normal performance characteristics.

Leakage Current and Shelf Life

Figure 3 described the $R_{Leakage}$ component as the DC Leakage current I_L. Leakage current is the residual current that flows once a capacitor has been fully charged. During the manufacture of an electrolytic capacitor the leakage current is managed down to the level specified in the range data. Figure 7 shows this process. Leakage current is specified at 20°C temperature.

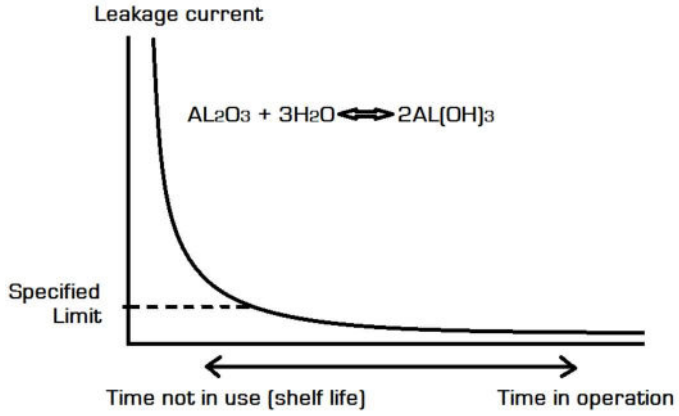

Figure 7

In operation, the leakage current will continue to gradually reduce and settle to a level somewhat less that the specified level. The time to settle will vary depending on the size of the capacitor but can typically take several hundred hours for a screw terminal capacitor.

Leakage Current Multipliers

The leakage current value of an aluminium electrolytic capacitor is influenced by ambient temperature and by ratio of working voltage to rated voltage. Figure 8 give some indication of the multipliers that can be generally applied to each series.

Tamb [°C]	AR-AY-AKS-ACC-ACS	AS	AP	AZ	AT
25	1	1	1	1	1
35	1.2	1.2	1.2	1.2	1.2
45	1.4	1.4	1.2	1.4	1.4
55	1.8	1.8	1.6	1.8	1.8
65	2.5	2.4	2.2	2.4	2.4
75	3.5	3.0	2,8	3.0	3.0
85	5.0	4.0	3,9	4.5	4.5
95	N.A.	N.A.	N.A.	6.8	6.2
105	N.A.	N.A.	N.A.	9.0	8.3

Figure 8

Leakage current decrease Vs. Voltage derating

If the voltage applied to the capacitor is lower than the rated voltage, the leakage current decreases accordingly and the approximate reduction factor is shown in Figure 9

Vapplied/Vrated	1	0,9	0,8	0,7	0,6	0,5	0,4
Multiplier	1	0,75	0,70	0,55	0,45	0,30	0,20

Figure 9

Shelf life

Shelf life is where the electrolytic capacitor is stored dormant, either within equipment, or individually. Time, humidity and temperature will have an effect on a dormant capacitor where the leakage current will slowly increase over time without voltage present. A reversal of the aging process will occur as a chemical change will occur. As such, re-aging will be required before use. For how long you can leave a capacitor on the shelf at what temperature is shown in figure 10.

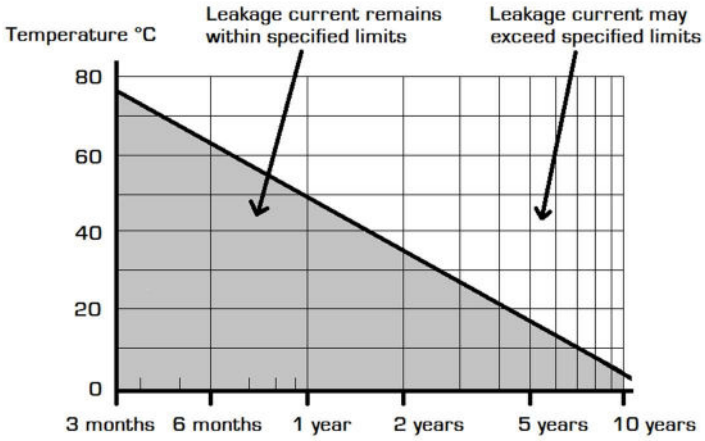

Figure 10

In a typical warehouse, the shelf life should be a minimum of 2 years. Beyond this, the leakage current may exceed the limits. If re-aging is required then this needs to be completed at room temperature. Connect a voltage supply equal to the rated voltage, but current limited to a value equal to the specified leakage limit of the capacitor. Anything from 1 to 4 hours may be required to re-age depending on the initial condition. Care should be taken when re-aging with high voltages.