

DERATING IN FUSE BASES AND FUSE-LINKS INSTALLED AT HIGH ALTITUDE

Electrical materials installed at high altitude above sea level have a greater temperature rise than normal values, because the air is less dense and the cooling capacity is reduced due to reduced convection.

To prevent overheating that could cause deterioration in the fuse bases and premature operation of fuse links (due to aging), it is necessary to apply a derating factor of 0.5% for each 100 m above 2000 m above sea level.

We can calculate the derating factor by the formula:

$$C_a = 1 - \left(\frac{(H-2000)}{100} * 0,005 \right)$$

Where:

C_a is the derating factor by altitude > 2000 m.

H is the height (in m) above sea level.

Maximum working current for the device should be calculated multiplying the derating factor by the rated current:

$$I_{MAX.} = I_N \times C_a$$

Where:

I_{MAX} is the maximum working current.

I_N is the rated current of fuse base or fuse link.

C_a is the derating factor by altitude > 2000 m.

Table 1 – Derating factors for different altitudes

H (m)	C_a
2500	0,975
3000	0,95
3500	0,925
4000	0,90
4500	0,875
5000	0,85

CALCULATION EXAMPLE

If we want to install a fuse-link with rated current of 160A at 4800 m above sea level, the maximum working current will be:

$$C_a = 1 - \left(\frac{(4800-2000)}{100} * 0,005 \right) = 0,86$$

$$I_{MAX.} = 160 \text{ A} \times 0,86 = 137,6 \text{ A}$$

If we need a 160A protection, then we must use a 200A fuse-link that will be able to work up to 172 A once applied the appropriate derating.