Characteristic curves

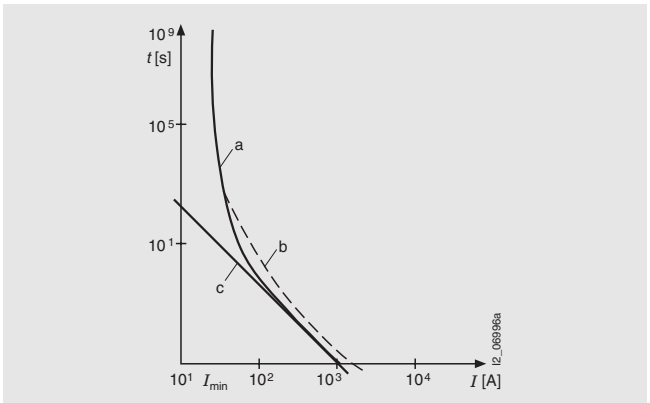
Overview

Legend

t_{vs} = Virtual melting time
I_c = Max. let-through current
I_{eff} = r.m.s. value of the prospective short-circuit current
I^2t_s = Melting I^2t value
I^2t_a = Breaking I^2t value
I_n = Rated current
P_v = Rated power dissipation
$\Delta\vartheta$ = Temperature rise
k_a = Correction factor for I^2t value
U_w = Recovery voltage
$\hat{U}_s$ = Peak arc voltage
i_p = Peak short-circuit current
① = Peak short-circuit current with largest DC component
② = Peak short-circuit current without DC component
U = Voltage
i = Current
t_s = Melting time
t_L = Arc quenching time

Time/current characteristics

Melting times of fuse links are shown in the time/current diagrams with logarithmic scale and depending on their currents. The melting time characteristic curve runs from the smallest melting current, which just about melts the fuse element, asymptotic to the I^2t lines of the same joule value in the range of the higher short-circuit currents, which specifies the constant joule value I^2t. To avoid overcomplication, the time/current characteristic curve diagrams omit the I^2t lines (c).



General representation of the time/current characteristic curve of a fuse link of gL/gG operational class

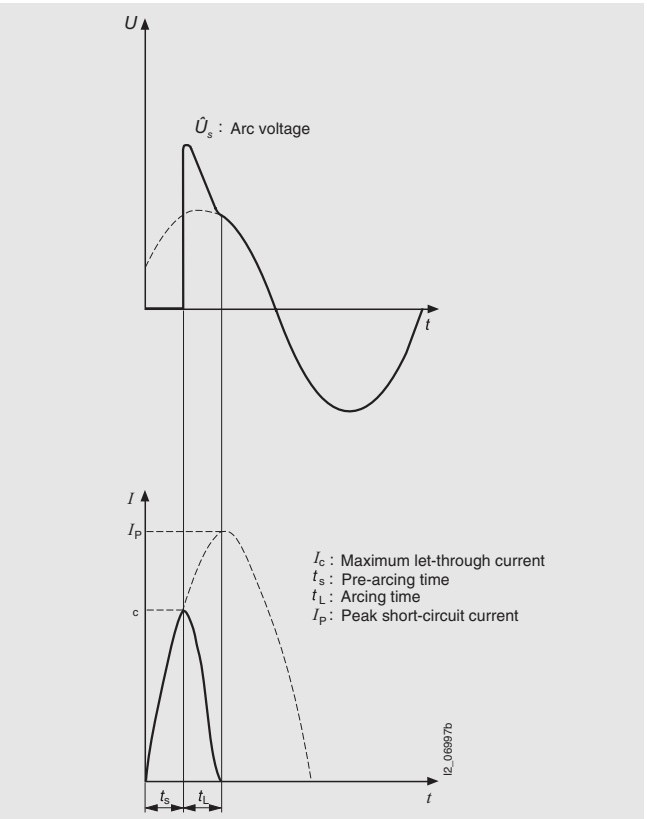
I_{min} : Smallest melting current
a : Melting time/current characteristic
b : Break time characteristic curve
c : I^2t line

The shape of the characteristic curve depends on the outwards heat transfer from the fuse element. DIN VDE 0636 specifies tolerance-dependent time/current ranges within which the characteristic curves of the fuse must lie. Deviations of ±10 % are permissible in the direction of the current axis. With Siemens LV HRC fuse links of gL/gG operational class, the deviations work out at less than ±5 % – a mark of outstanding quality. For currents up to approx. 20 I_n, the melting time-current characteristic curves are the same as the break time characteristic curves. In the case of higher short-circuit currents, the two characteristic curves move apart, influenced by the respective arc quenching time.

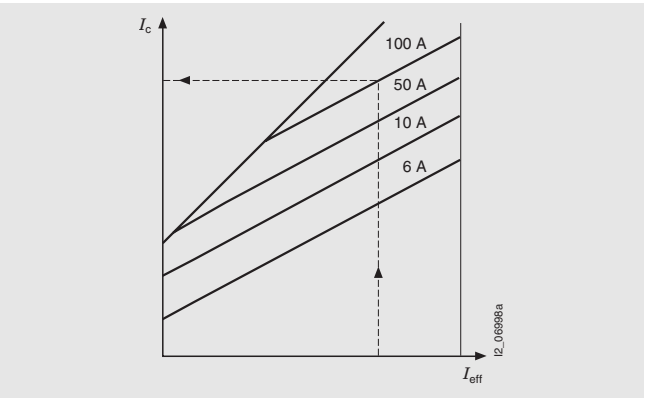
The difference between both lines (= arc quenching time) also de-

The Siemens characteristic curves show the mean virtual melting time characteristic curves recorded at an ambient temperature of (20 ±5) °C. They do not apply to preloaded fuse links.

The fuse element of the fuse links melts so quickly at very high currents that the surge short-circuit current I_p is prevented from occurring. The highest instantaneous value of the current reached during the shutdown cycle is called the let-through current I_c. The current limitations are specified in the current limiting diagrams, otherwise known as let-through current diagrams.



Oscillograph of a short-circuit current shutdown through a fuse link



Current limitation diagram;
let-through current diagram of LV HRC fuse links, size 00,
operational class gL/gG,
rated currents, 6 A, 10 A, 50 A, 100 A