

I²t - TEST METHODS AND DATA PRESENTATION

A major concern of the fuse industry and users alike is how different fuse manufacturers arrive at the I²t values published in their catalogs, and what these numbers signify. For the Miniature and Micro fuses included in this catalog, there are no prescribed test procedures/criteria contained in UL/CSA248 or IEC127 for evaluating I²t. Without a regulatory frame of reference, the user must rely on information provided by the fuse manufacturer. Therefore, to provide users with meaningful data, a fuse catalog should include information that clearly indicates the specific test methods used in arriving at the published I²t values.

At past IEC Working Group meetings covering Policy for Miniature Fuse Specifications, it was unanimously agreed that published I²t values should be defined as:

MELTING I²t measured at 10I_n, using constant current DC

Every major fuse manufacturer was represented in this working group. Although this agreement represents a starting point, there are additional factors which must be considered. The use of 10I_n (10 times rated current) was considered expedient, since data for most IEC Style 5x20mm fuses already exists. However, the use of 10I_n does not always produce true adiabatic conditions (opening times less than 1/2 cycle).

For example, some slow-blow/time-lag designs require a higher multiple of rated current to obtain a true I²t value. Conversely, printed element designs (e.g. chip fuses) have their film-like elements intimately bonded to their substrates and are therefore unable to exhibit the true, adiabatic behavior essential for producing a unique, single value I²t, as is typical of wire element constructions. The thermal heat sinking that results from the large contact area between the printed element and the planar base (chip) can cause the fuse I²t to vary as a function of clearing time by one or more orders of

magnitude. In order to generate a meaningful base value for I²t, a test current that produces clearing in just under 1/2 cycle (8 mSec for 60Hz and 10msec for 50Hz) should be used. I²t values arrived at using this approach allow for valid comparisons between chip fuses of different ratings or from different series.

Bel I²t Data

The data included in this catalog represent nominal MELTING I²t. The values indicated for wire element designs are those measured at 10I_n as well as those recorded for melting times less than 10mSec (at 50Hz), using constant current DC.

For chip designs, the values are those measured during clearing times of just under 1/2 cycle. Additional curves displaying chip fuse I²t as a function of clearing time are being developed and will be posted to our Web site and will be printed in future catalogs.