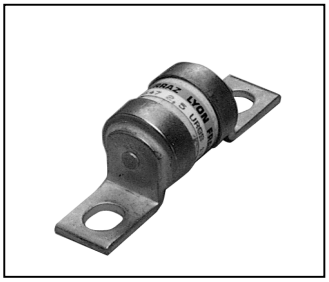
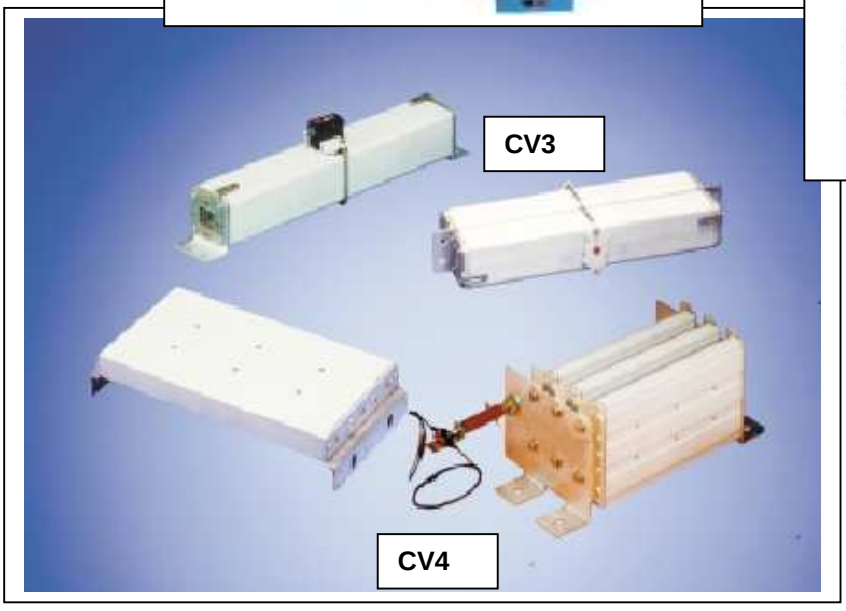
FUSE TECHNOLOGIES AND OPERATION

1. MAIN TECHNOLOGIES



American style
semi conductor fuses

Rotating
fuses



DIN 43620

Figure 6

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2. DIFFERENT CONSTRUCTION EXAMPLES

2.1. PSC with flat end contacts - general view of the technology

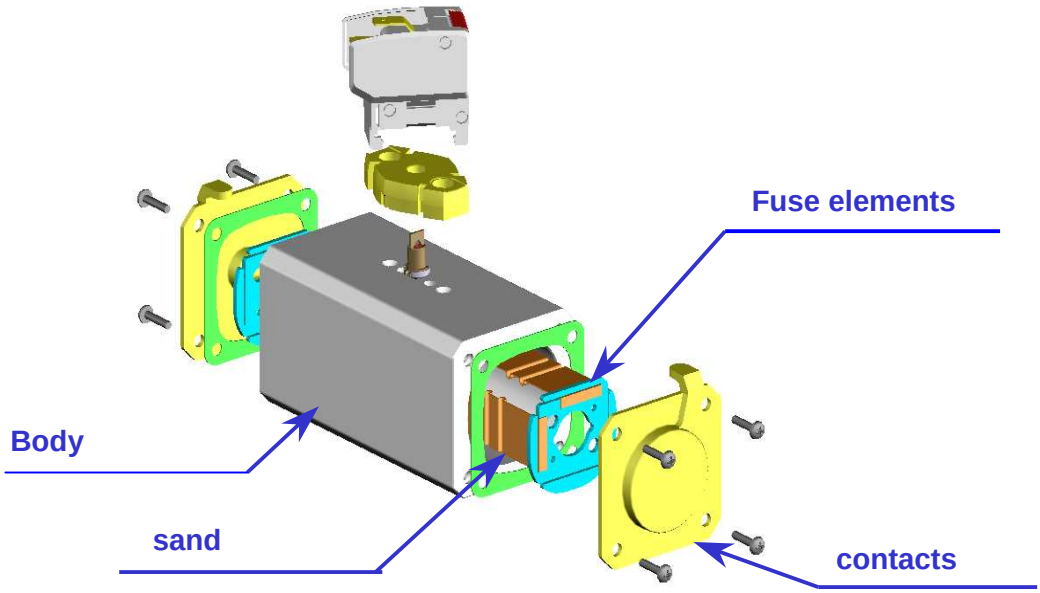

Figure 2

2.2. PSC-LR (C6) general view of the technology

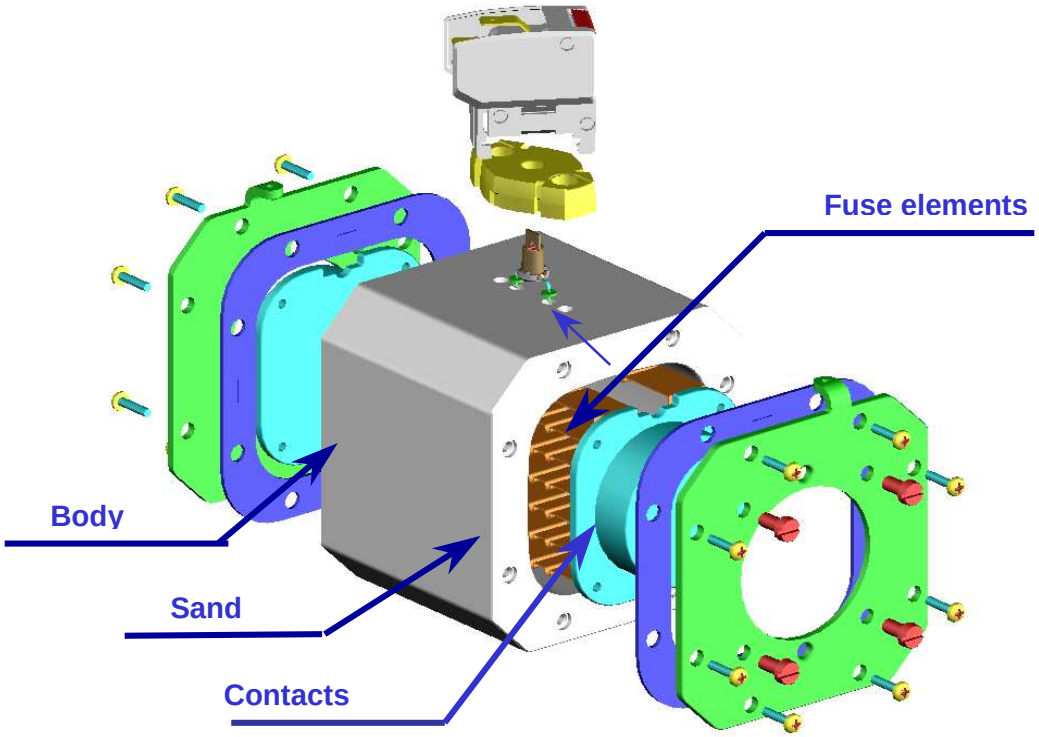

Figure 3

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2.3. Standard gG NH style fuse

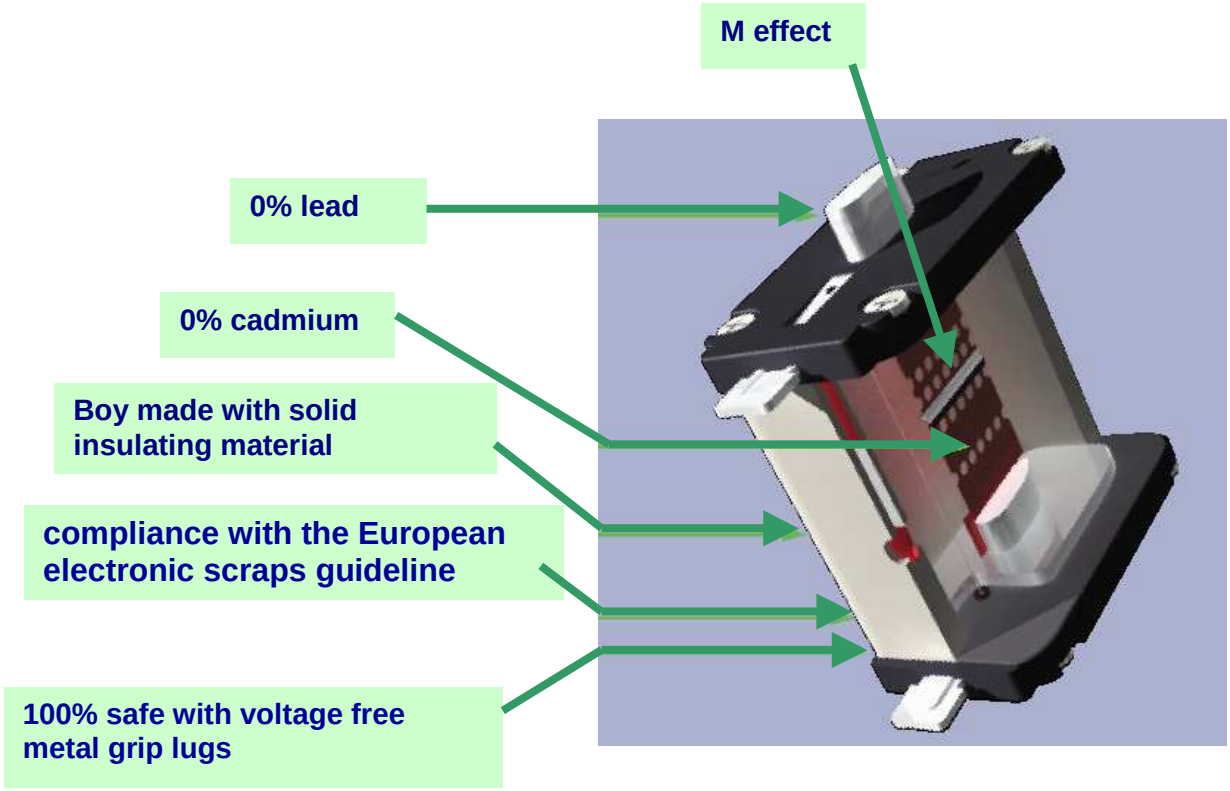

Figure 4

2.4. « Dual –Element » example for an American « Time Delay » fuse

Figure 5 describes a **« Dual –Element » and** Clearly shows two types of fuse elements are in series:

- one element for short circuits interruptions
- one element for overloads interruptions equipped with a spring and highly thermally sensitive section

- Figure 12 in the last page shows another example of design.

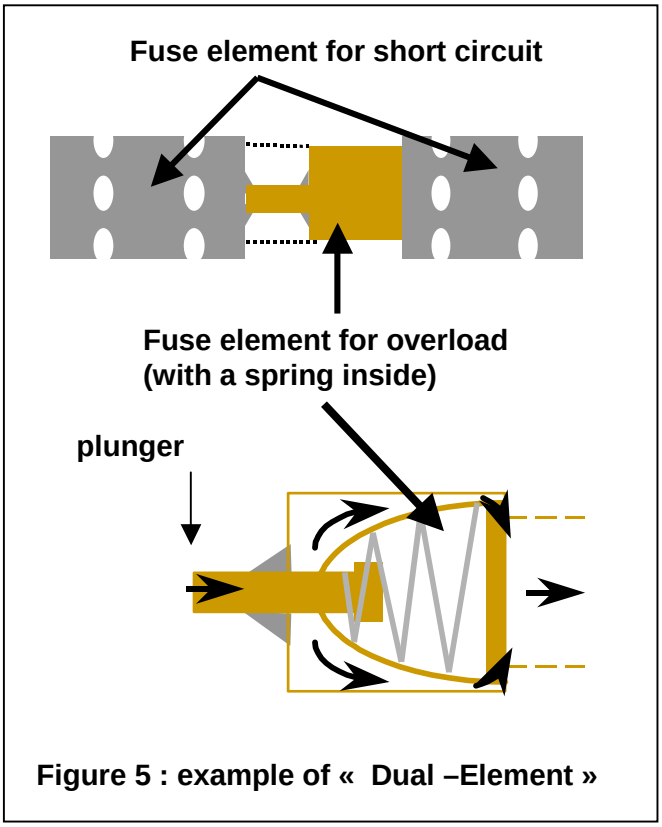

Figure 5 : example of « Dual –Element »

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3. OVERLOAD INTERRUPTION (UP TO ABOUT 10 I_N)

- Fast-acting :gG, gN, J, L ..fuses are designed to interrupt low overloads because they have fuse elements with M-effect . Figure 6
- Semiconductors Fuses type gR and gS only are designed to interrupt low overloads because they have fuse elements with M-effect . Figure 6

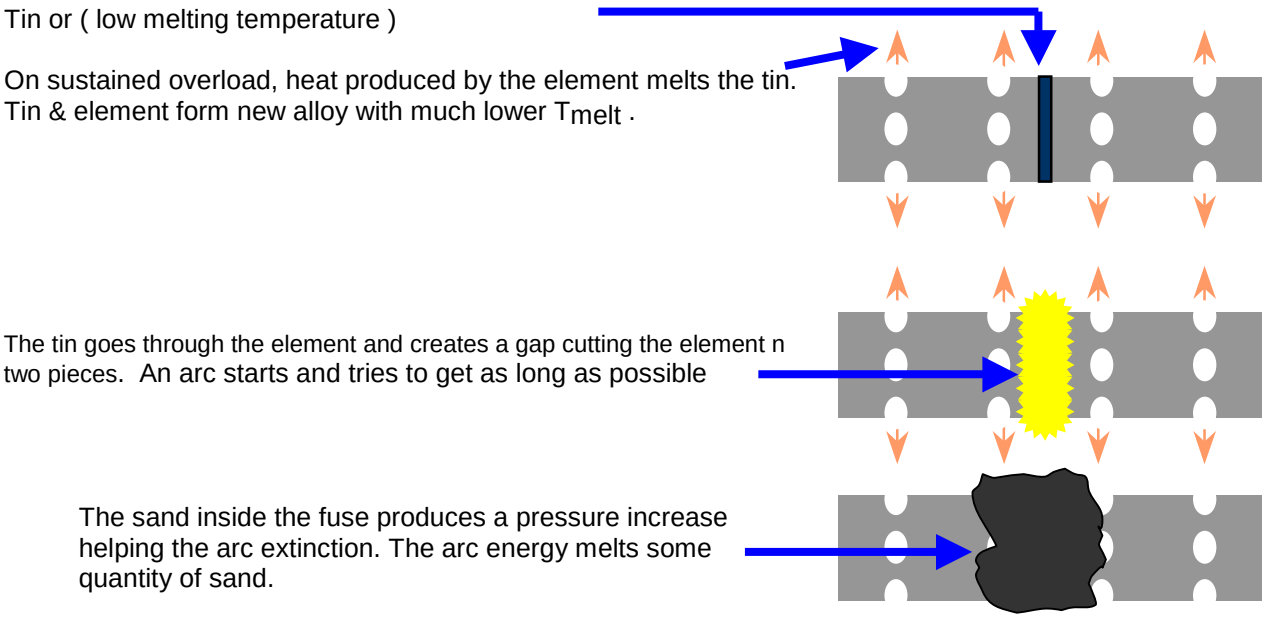

Figure 6: fuses gG, gR-, and UL fuses class J, L, H, CC …

- Time-delay : AJT, A4BQ, A6D, ATDR…fuses are designed to interrupt low overloads because they have fuse elements in 2 parts « Dual-Element ». Figure 7

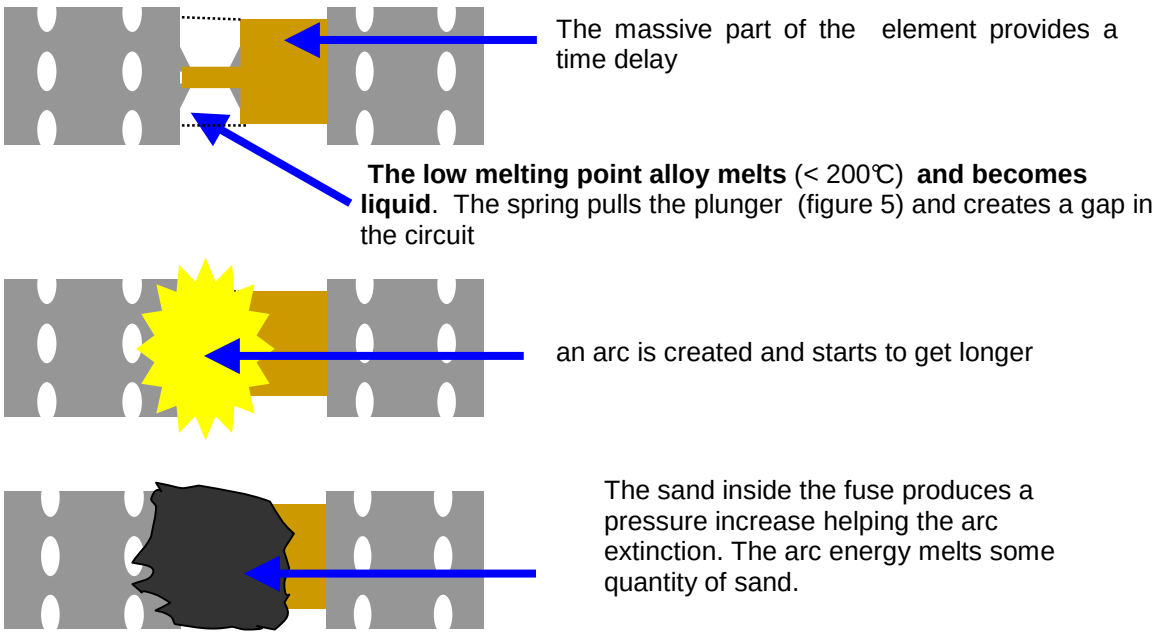

Figure 7 : « Time-Delay » fuses AJT, A4BQ, A2D & A6D etc …

- UR and SR type Semiconductor Fuses are not designed to interrupt overloads
- aM type fuses can not interrupt overloads at times above 60 s

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4. SHORT CIRCUIT INTERRUPTION (GENERALLY ABOVE 10 I_N)

All fuse types create several arcs in series by melting several rows of constrictions in to obtain a better control of the arc. The sand is absolutely necessary in order to obtain:

- the shortest arc time
- the best current limitation
- less I^2t and energy

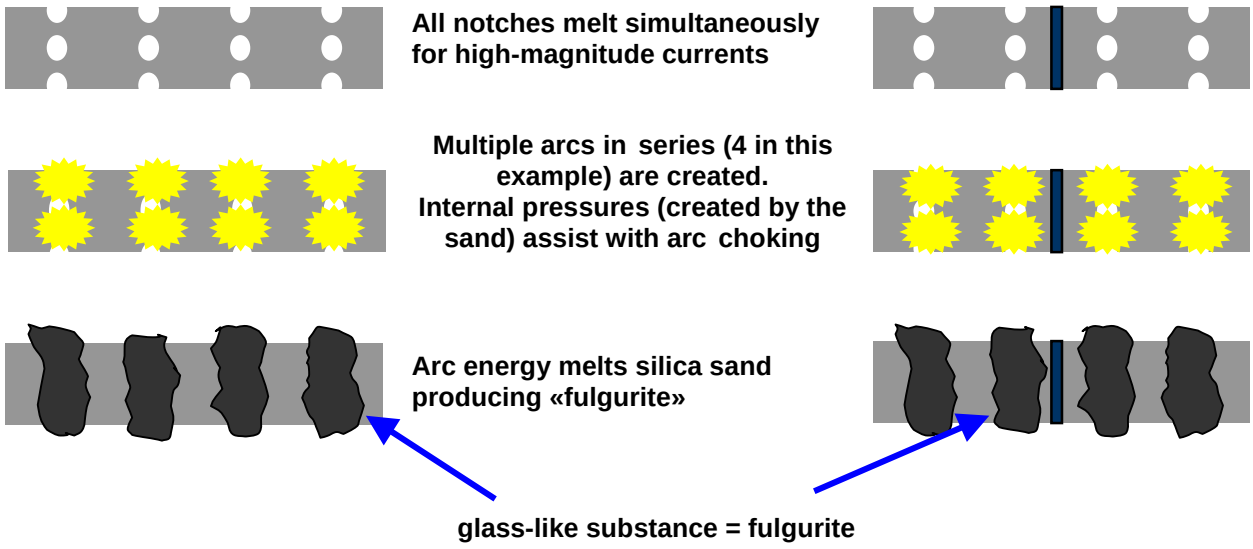

Figure 8: aM, UR- , and Form 101

Figure 9: gG, gR-, and UL class J, L, H, CC etc.

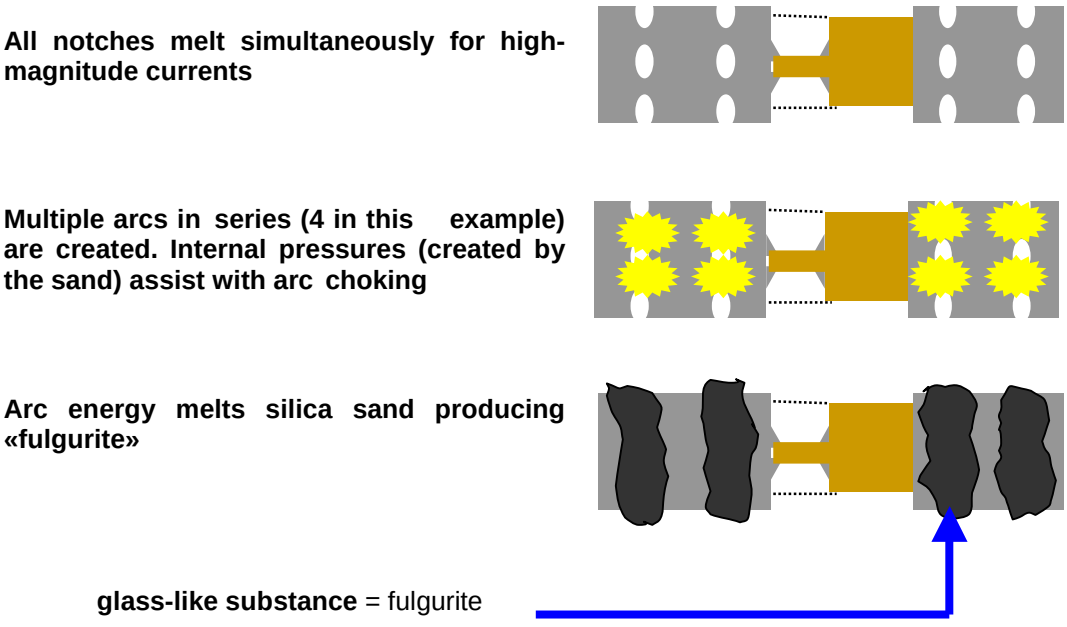

Figure 10 : fuses « Time-Delay » AJT, A4BQ, A2D & A6D etc …

- Figures 8, 9 et 10 show all fuse types described in IEC 60269 and UL 248 standards interrupt a short circuit exactly in the same manner.
  However there are some differences in the speed. For example **a fuse for semi conductor protection is much faster than an aM fuse or a** « Time-Delay » fuse.

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5. COMPARAISON DE 5 COURBES

*** TH-PR = THERMO-PROTECTION**

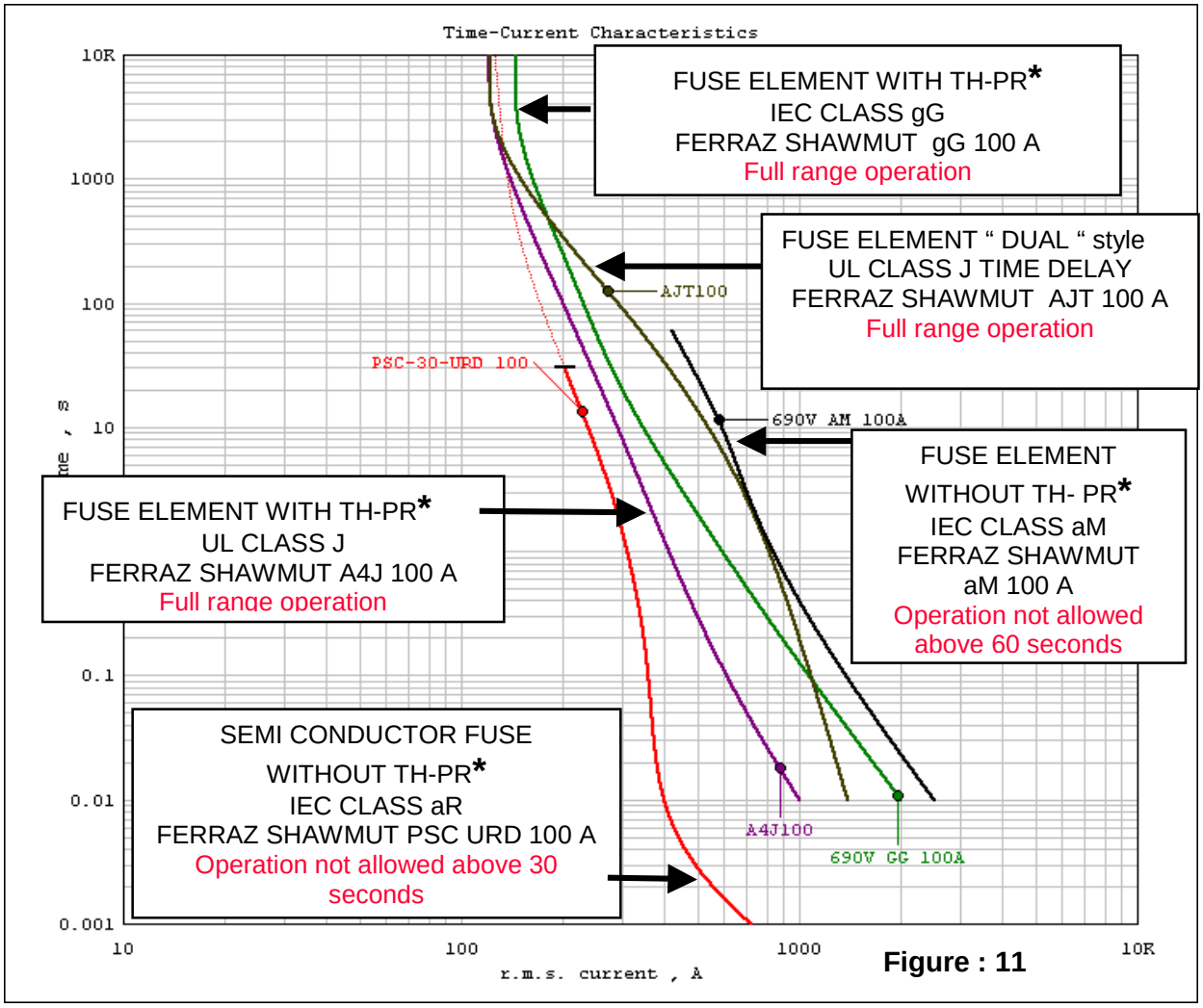
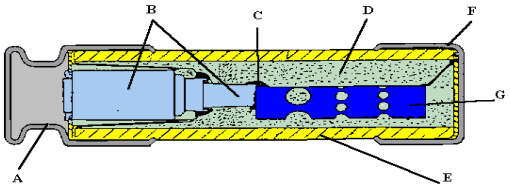


Figure : 11



A. Capsule pour système de réjection
B. Elément fusible pour surcharge
C. Soudure avec eutectique
D. Sable
E. Corps
F. Capsule standard
G. Elément fusible pour court-circuit

Figure 12 : another example of « Dual Element » .
Fusible class RK5, FERRAZ SHAWMUT type TRS

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