Fuse technology and operation

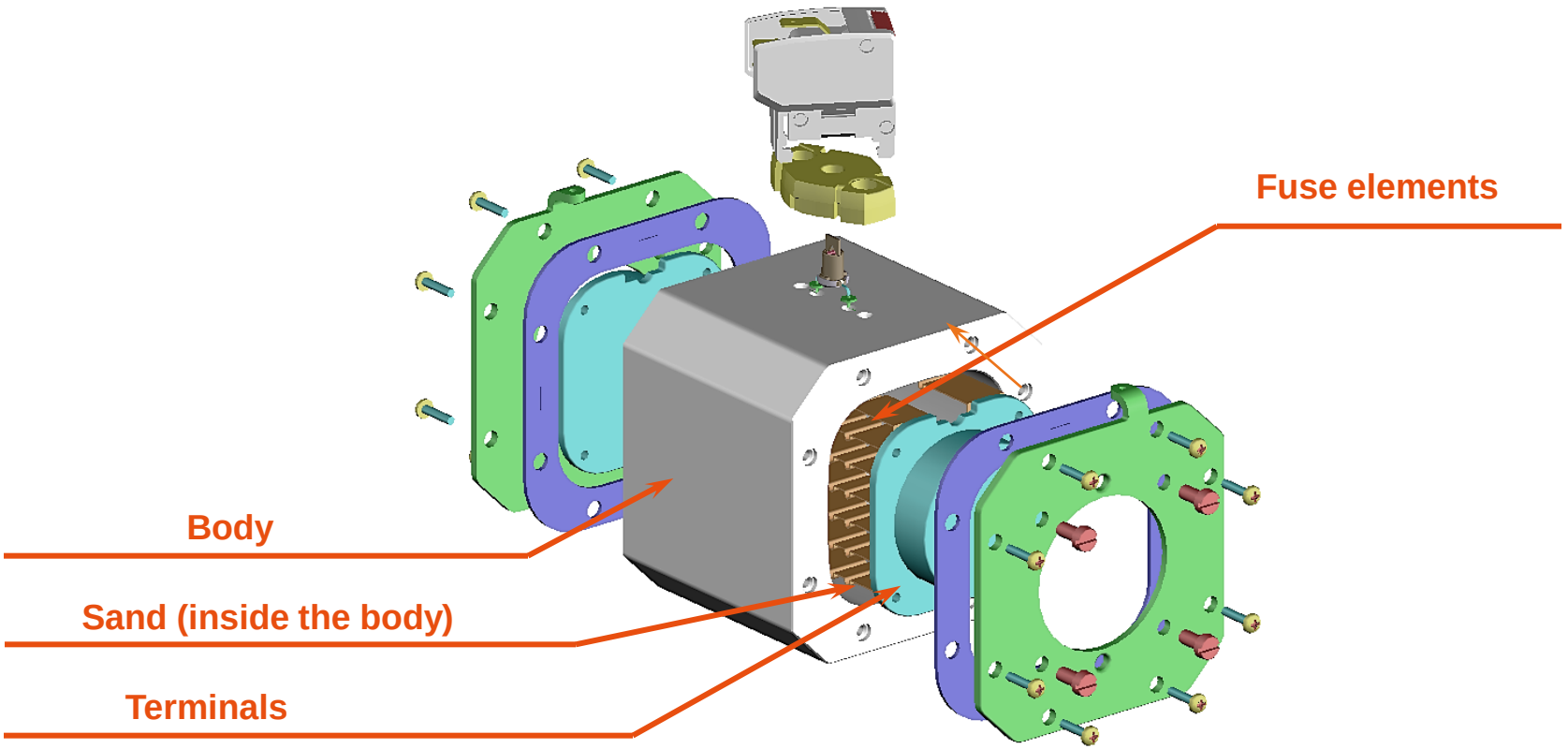
EduPack Training Module

2012

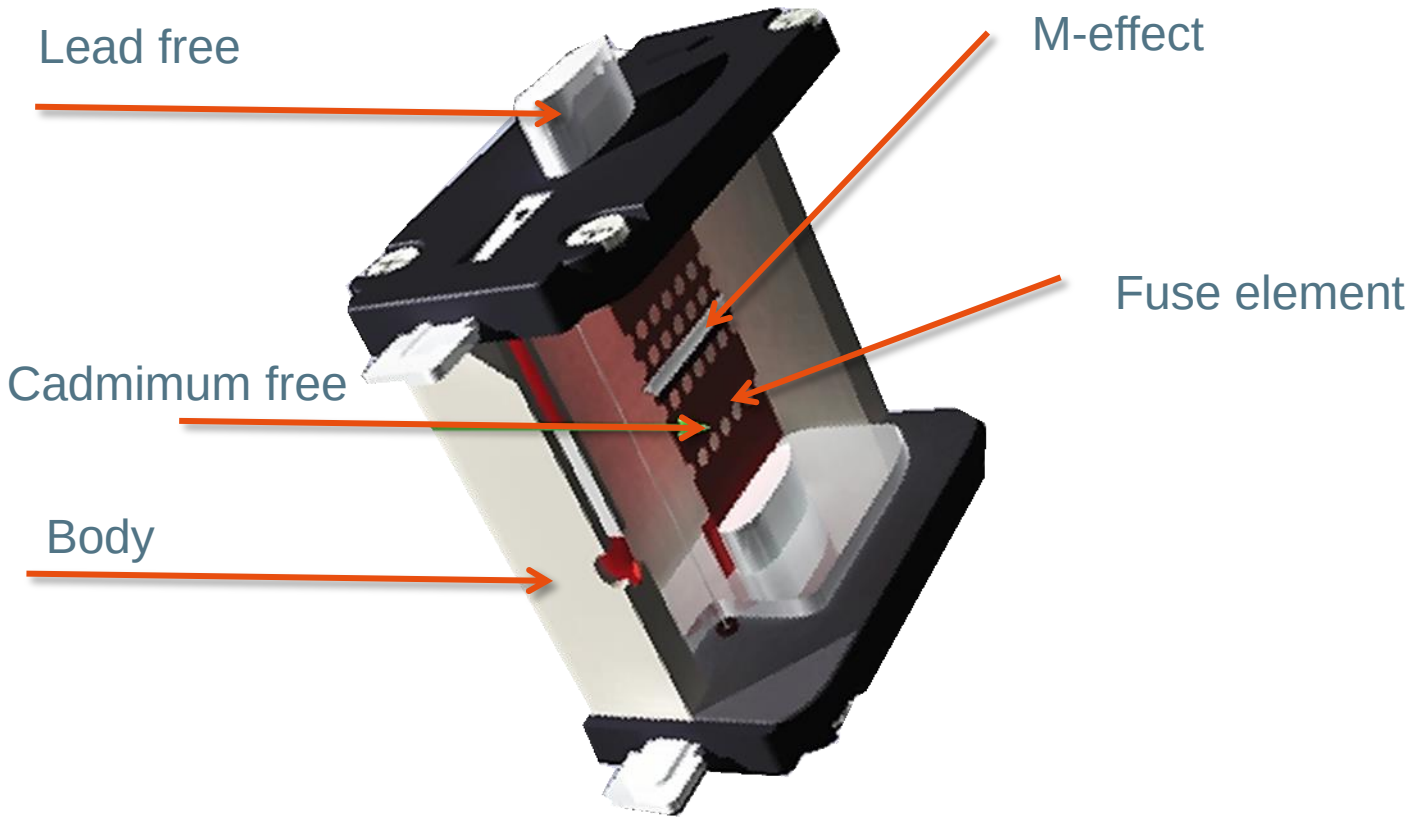
TECHNOLOGY STYLES

Ferrule (Cylindrical)		North America / Euro
Tag		British / German
Blade		North America / Euro
Flat		North America / Euro

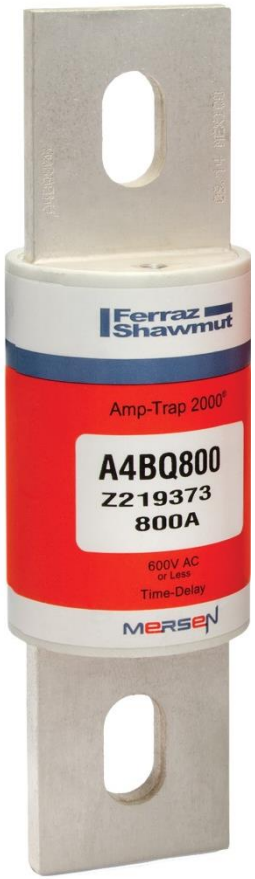
General exploded of PSC-large rectifier technology

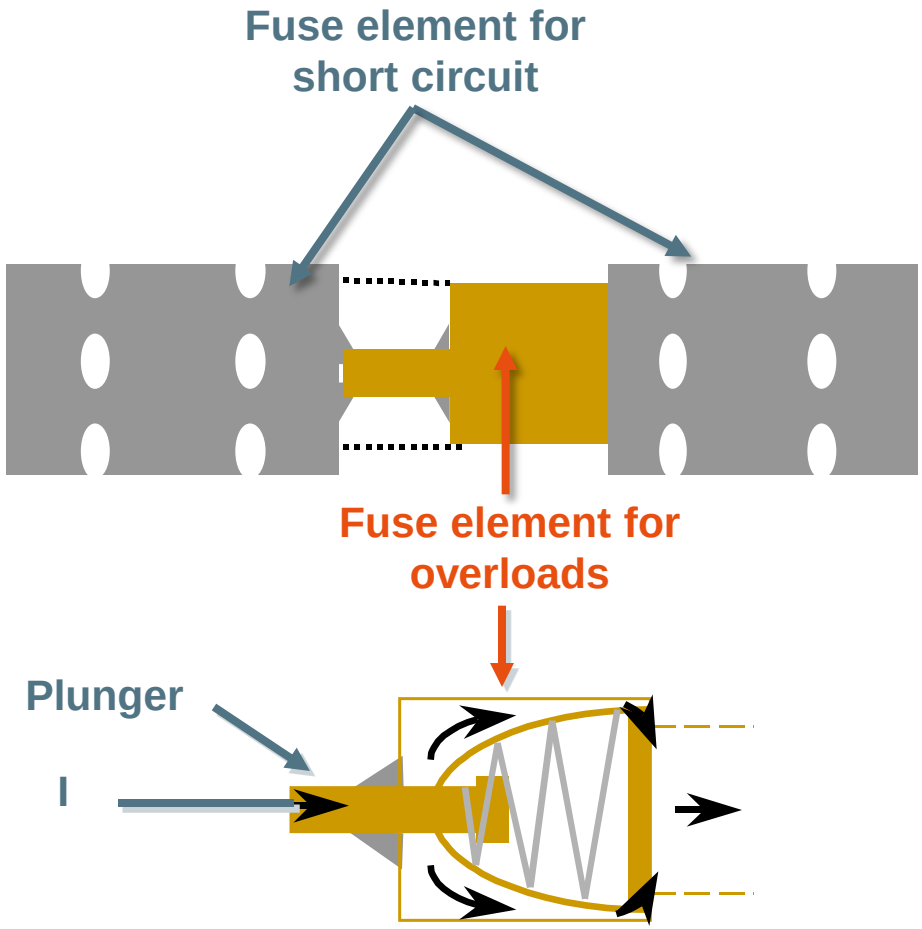


gG STANDARD FUSE WITH M-EFFECT FUSE ELEMENT



DUAL ELEMENT
EXAMPLE WITH DESIGN OF TIME-DELAY FUSES





FUSES UNDER OVERCURRENT CONDITIONS

Overloads ≤ 1000% I_{FLA}

- Fast-acting :gG, gN, gD ,J, L .. are designed to interrupt low overloads.
- Time-delay : AJT, A4BQ, A6D, ATDR… are designed to interrupt low overloads.
- Semiconductors Fuses type gR and gS are designed to interrupt low overloads.

- Semiconductors Fuses type UR and SR can not interrupt overloads
- Motor circuit fuses type aM can not interrupt overloads.

Short-circuits > 1000% I_{FLA}

- All fuse types will create several arcs in series by simultaneously melting several rows of notches to achieve the arc control.
- Silica sand: absolutely necessary to get the shortest arcing time, better current limitation, less I^2t and energy.

I_{FLA} = Full Load Amps

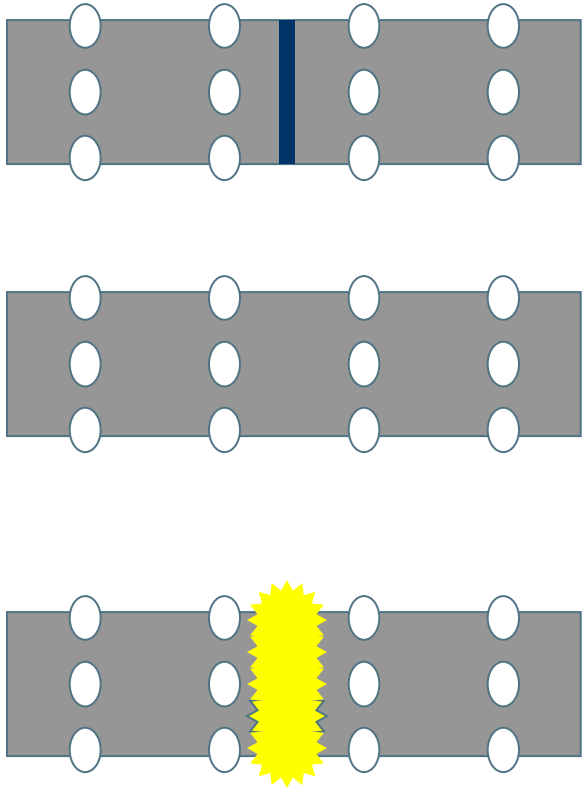
OPERATION OF A FUSE WITH M-EFFECT UNDER OVERLOAD

Tin or tin-alloy solder added on element

On sustained overload, heat produced by the element melts the tin-alloy solder

Tin goes through the element and creates a gap

An arc starts



Safe oveload operation !

OPERATION OF A DUAL-ELEMENT FUSE UNDER OVERLOAD

Thermal mass provides time-delay

Low operating temp (< 200°C) ... Solder melts

Plunger of overload section retracts ... Arc created

Arc extinguished by distance and pressure

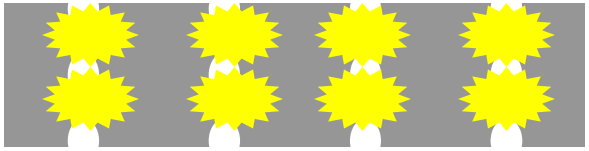
Specialized overload operation...no performance compromises !

SHORT CIRCUIT INTERRUPTION

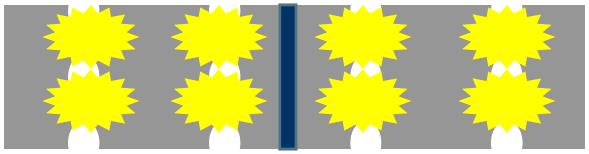
Fusibles without M effect
aM , URD, A50QS, A70QS etc..

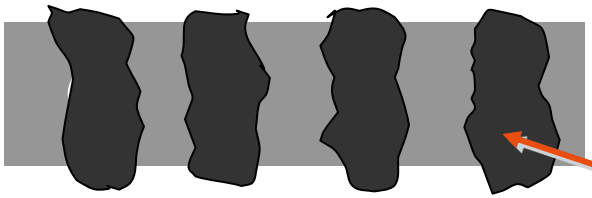
Fuses with M effect fuse elements
gG, gRB, class J, L fast acting etc..

All notches melt simultaneously for high-magnitude currents.

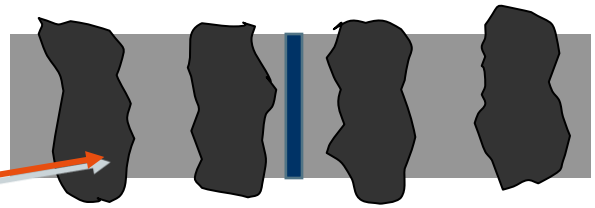


Multiple arcs in series (4 in this example) are created.





Melted sand = fulgurite (glass-like substance)



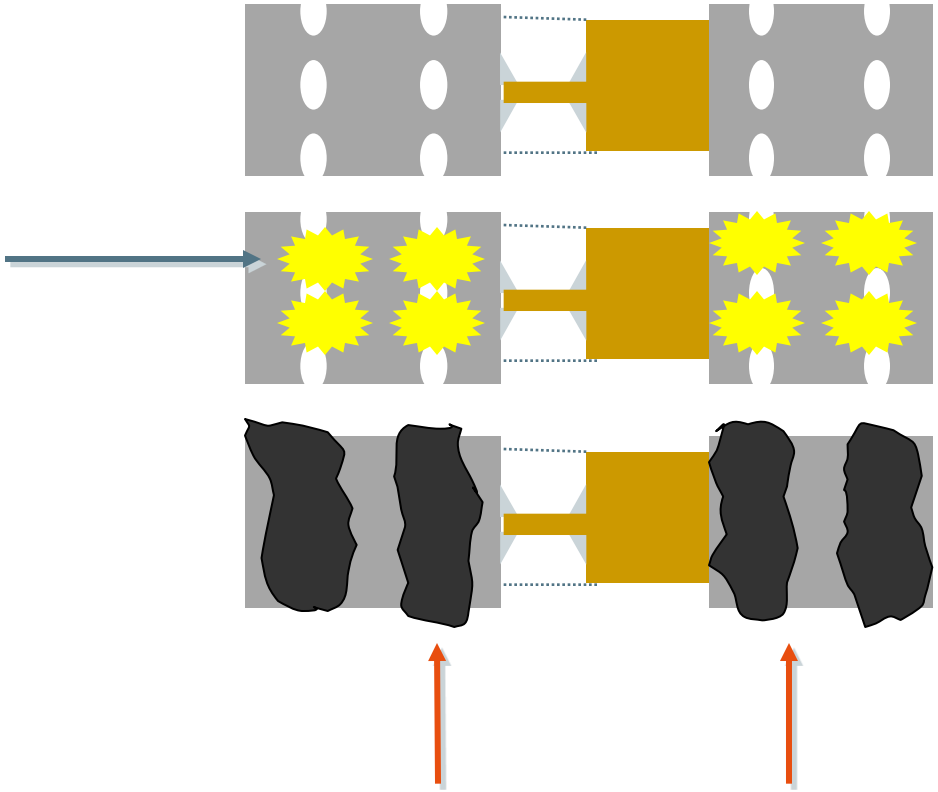
Result is energy limitation and safe breaking operation!

SHORT CIRCUIT INTERRUPTION WITH A DUAL-ELEMENT FUSE

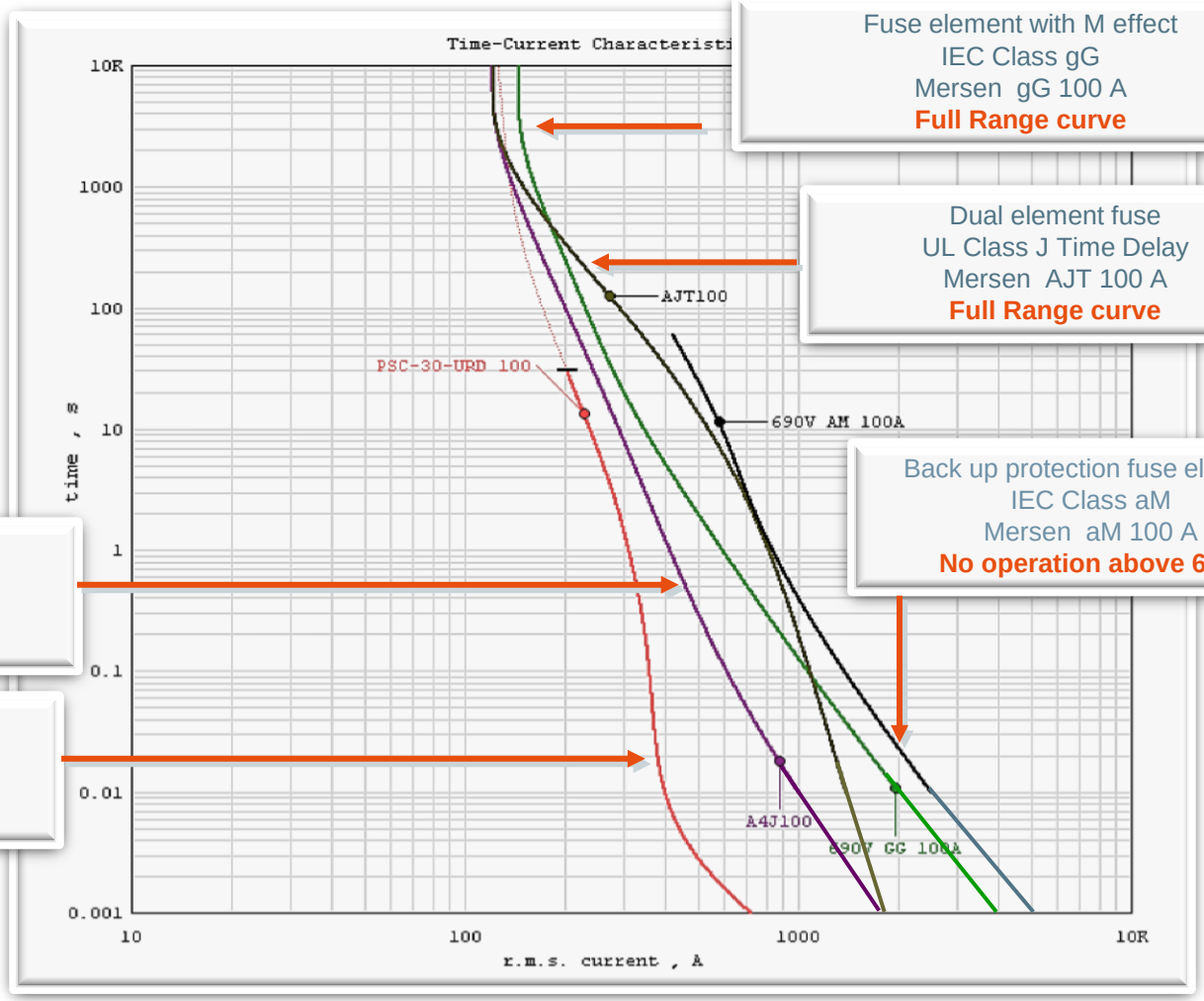
The process and the result are the same as for the fast acting fuses and semiconductor fuses.

All notches melt simultaneously for high-magnitude currents.

Multiple arcs in series (4 in this example) are created.



COMPARAISON OF CURVES OF 5 FUSES RATED 100A



Fuse element with M effect
IEC Class gG
Mersen gG 100 A
Full Range curve

Dual element fuse
UL Class J Time Delay
Mersen AJT 100 A
Full Range curve

Back up protection fuse element
IEC Class aM
Mersen aM 100 A
No operation above 60 s

Fuse element with M effect
UL Class J Fast acting
Mersen A4J 100 A
Full Range curve

Semiconductor fuse
IEC Class aR
Mersen PSC URD 100 A
No operation above 30 S


MERSEN
Expertise, our source of energy