

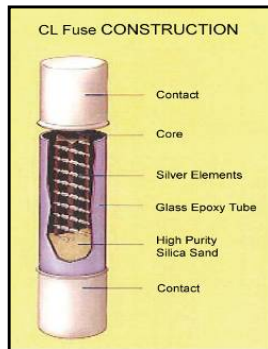


GPM Tomasz Komalski 2009

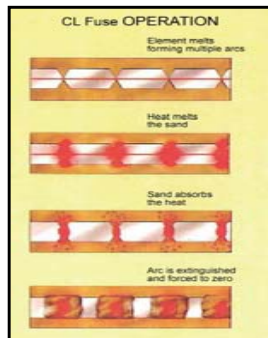
ABB Fuses Competitive Advantages

Competitive Advantages

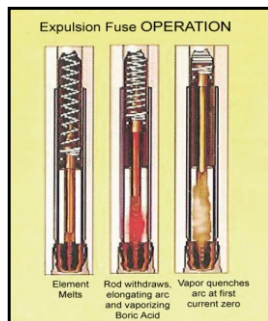
Basic comments



- ABB is a global manufacturer of both current limiting and expulsion (non-current limiting) fuses for medium voltage systems
- Fuses are tested according to IEC or ANSI standards, depending on design and market preferences



- Two housing materials are applicable – porcelain and resin-fiberglass. Both of them are characterized by high mechanical and thermal resistance
- ABB fuses have a special design for each application and are suitable for the protection of:



- Distribution transformers
- Voltage transformers
- Capacitor banks
- Motor circuits

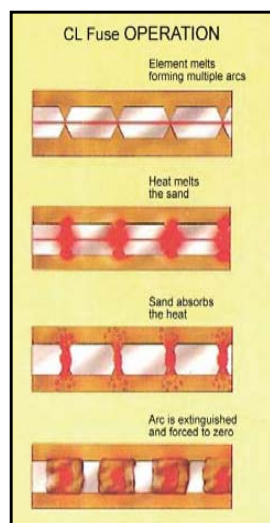
Competitive Advantages

Operation principles



▪Expulsion Fuses Operation based on ABB CXP type

The CXP expulsion fuse operation is based on melting a tin-lead or silver low current link. The pressure is generated by the hot arc making contact with the fiber lining of the fuse tube. The link is cooled and stretched as it is forced out of the tube. The fuse continues to conduct until a natural zero current occurs. The zero current is caused by the power system fault current crossing zero.

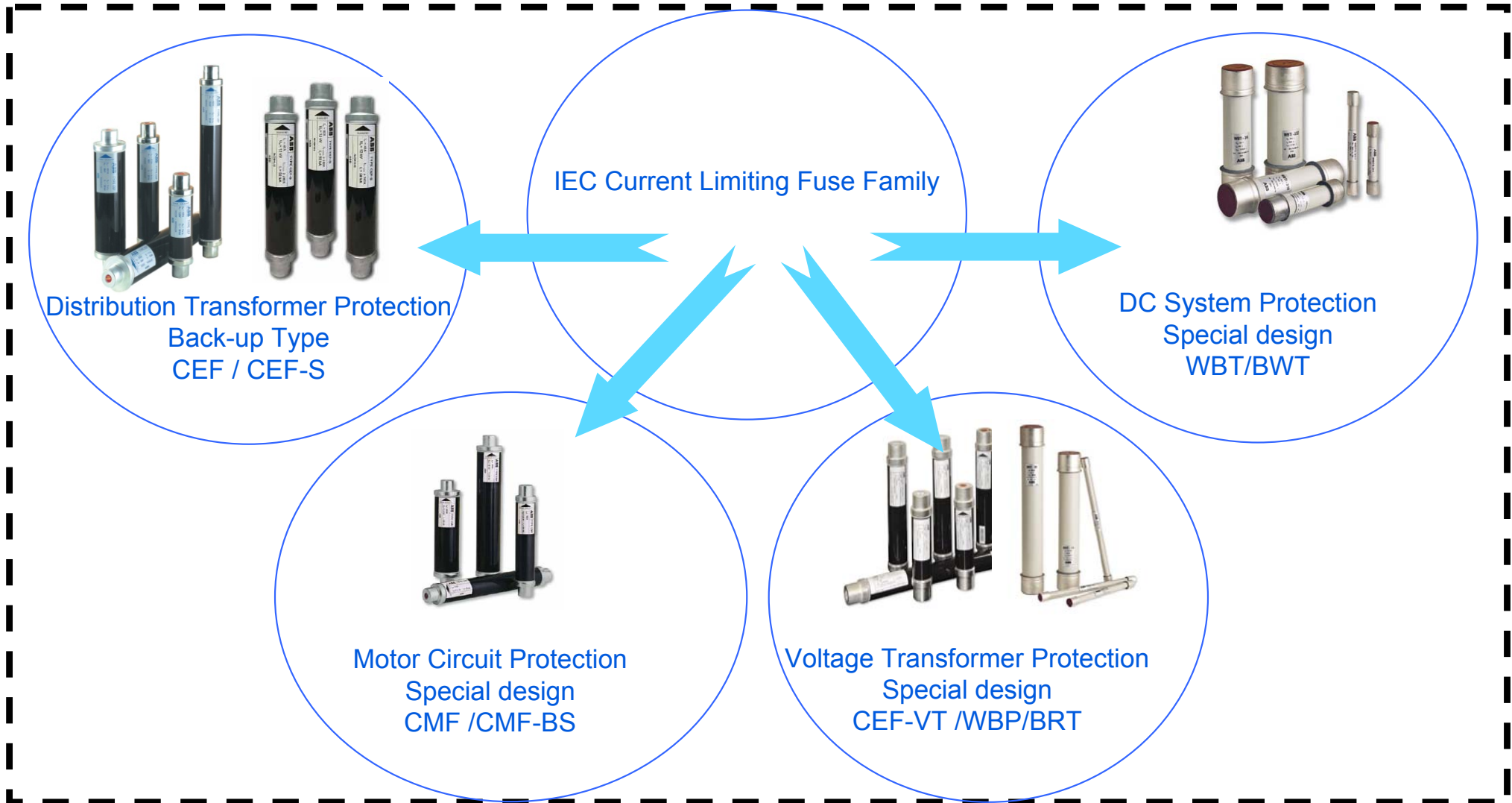


▪Current Limiting Fuses Operation based on ABB CEF type

The CEF fuse operation is based on melting a pure silver strip/wire element placed in a porcelain tube filled with sand. Active elements start to melt at the weakest points – overload spots or punched/notched places. When the arc voltage is above the test voltage level and reaches the max switching voltage, the fault current is limited and cleared before it achieves the expected maximum value. When the voltage reverses, the current is interrupted and the fuse is able to isolate and prevent the fault current from flowing in the reverse direction.

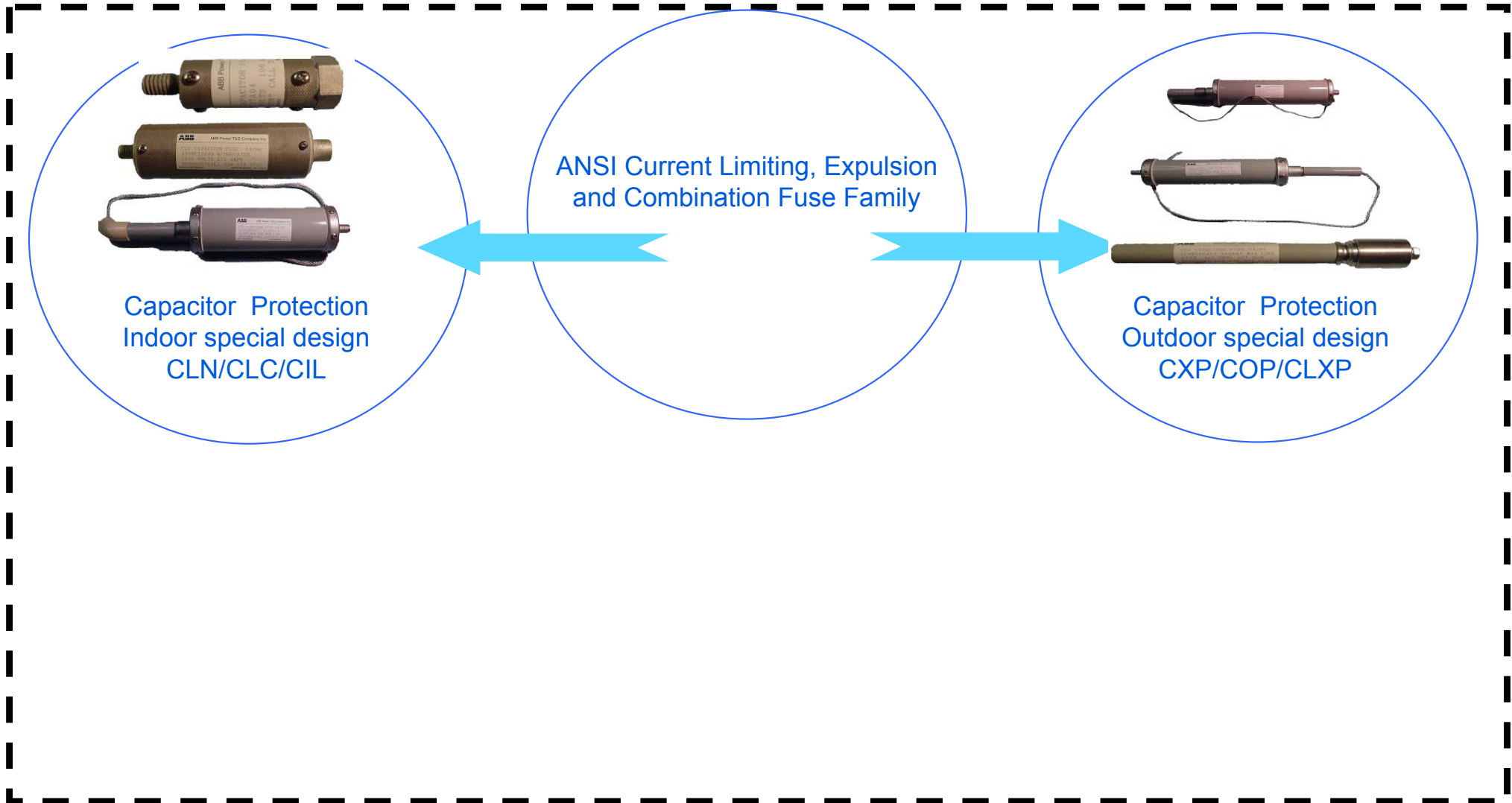
Competitive Advantages

Portfolio IEC



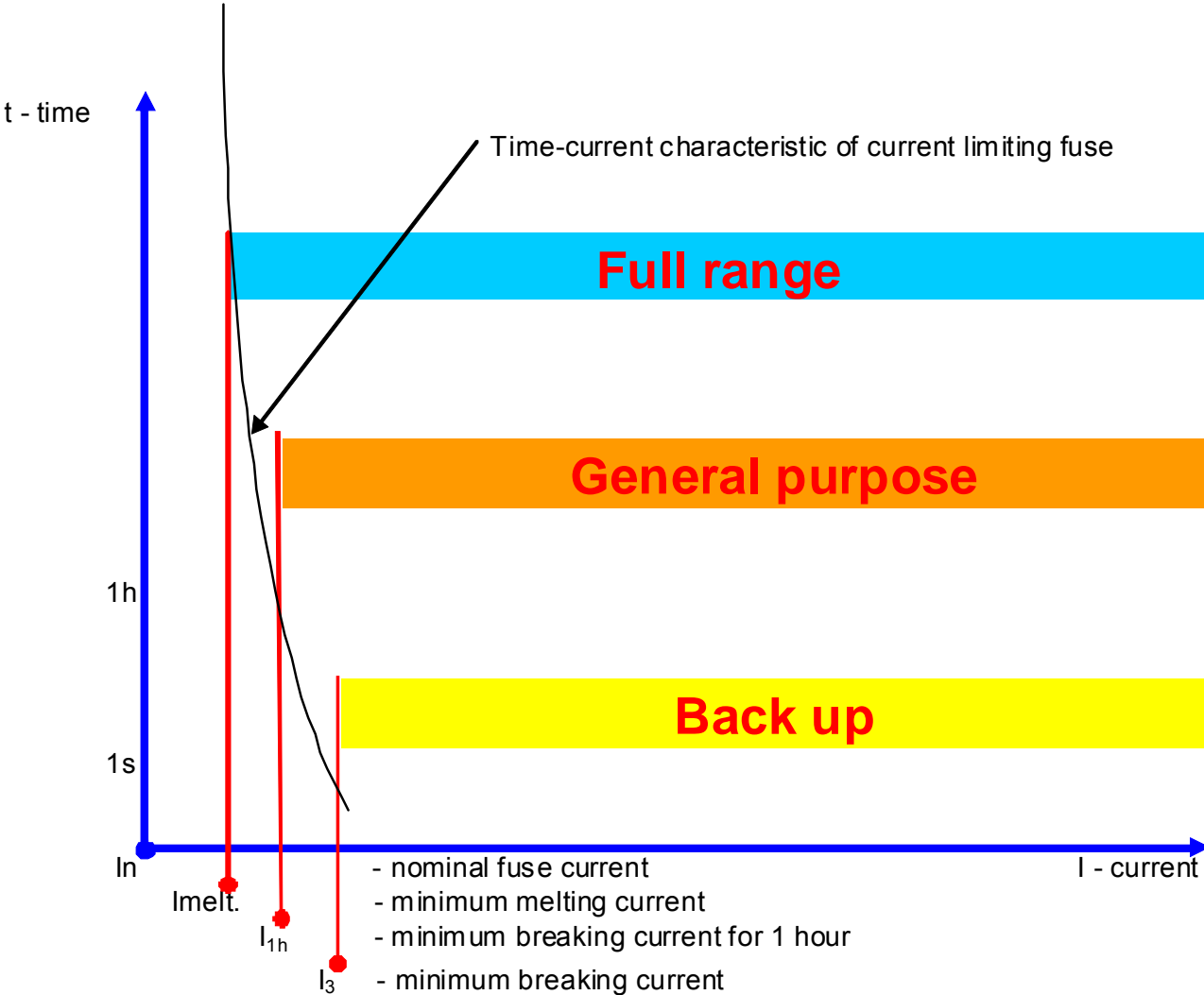
Competitive Advantages

Portfolio ANSI



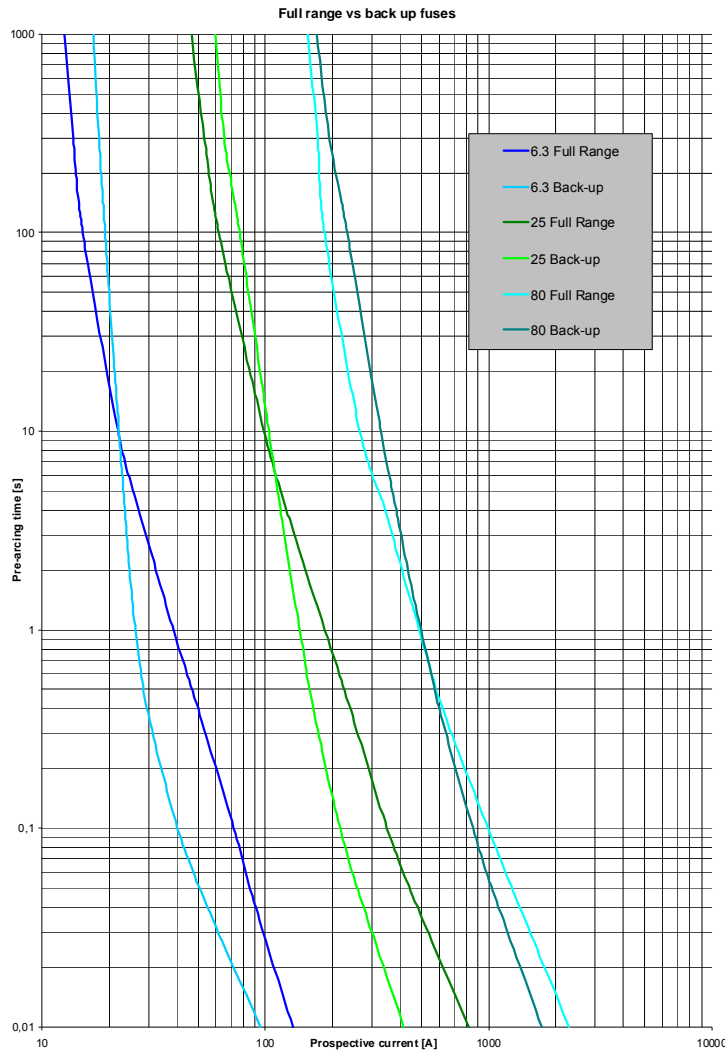
Competitive Advantages

Available Types of Current Limiting Fuses



Competitive Advantages

Application – Back Up vs. Full Range

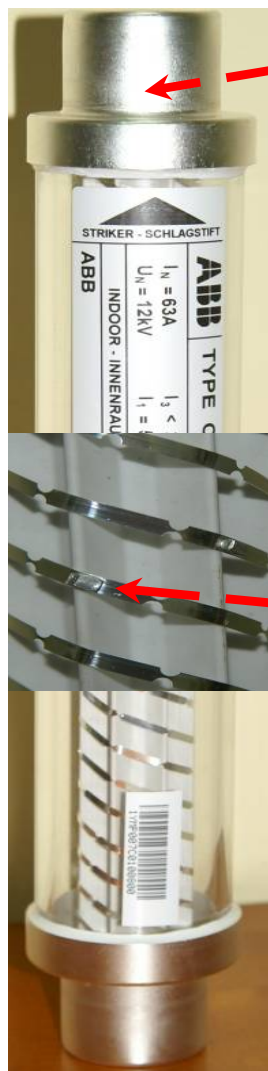


	Full range	Back-up
Time-current characteristic	Generally slower for high overloads	Generally faster for high overloads
Interruption time for lowest breaking currents	Hours	Below 1 hour
Interruption range	From minimum melting current	From minimum breaking current
Applicable for combination with switch disconnectors	Yes	Yes
Protection of distribution transformers, motors, capacitor banks	Yes - considering selection rules	Yes - considering selection rules
Current ratings	Limited	Wider
Price	Higher	Lower



Competitive Advantages

Design – Interruption Safe: Overload Spots + TCU



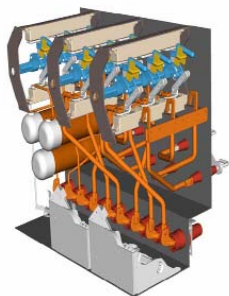
- Temperature Control Unit (TCU):
 - Operational conditions of TCU were defined especially for application in compact switchgear
 - $I \leq 1.1 \times I_n$ – no operation
 - $T \leq 105^\circ\text{C}$ – no operation (+20 °C safety margin)
 - $T \geq 150^\circ\text{C}$ – operation in time $t \leq 1\text{h}$
- Overload Spots and the M-Effect:
 - Increase the useful operational range of the fuse link by extending the range of correct operation for small overload currents
 - Prevent the arc from initializing near one of the fuse link ends, thus making the fuse link safer to use.
 - Significantly (more than 50%) reduce the temperature during fuse operation

Competitive Advantages

Application – Coordination of Interruption with LBS



- ABB fuse type CEF was type tested in accordance with the IEC fuse-switch combination standard
- CEF fuses are suitable for all types of switch disconnecter panels, both in open air and SF6 insulation
- Newly developed temperature activated striker pin (TCU) increases application safety in limited heat dissipation conditions
- CEF fuses inside RMU panels have defined corrective factors for safe operation and long term installation

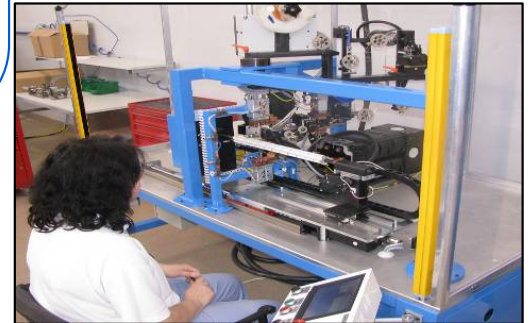
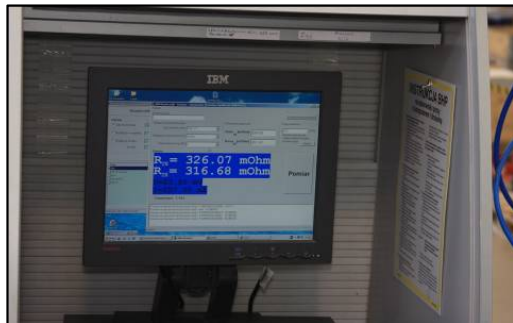


Competitive Advantages

Quality – Production process control



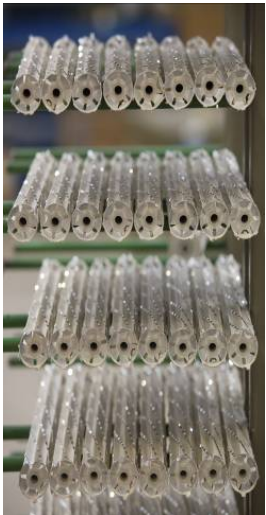
- High fuse-winding repeatability due to process automation (automated winding machines)
- 100% fuse-resistance control in two production steps; serial number stored in computer data base
- SPC implemented in production and incoming control



Competitive Advantages Summary



- Unique design of ABB CEF/CMF family featuring: overload spots; a temperature released striker pin (TCU); and a secure and safe interruption process even in case of small overload currents
- High breaking capability up to 63 kA and effective short-circuit prospective current limitation
- Compliance to IEC 62271-105 fuse-switch (LBS) combination standard for full voltage ratings
- Type tested (in scope of temperature rise and breaking performance) for application in SF6 RMU and air insulated panels
- Fuses are the fastest overload protection devices for high short-circuit currents



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