

# Fuses medium-voltage protection

## FAQs



This document presents the Frequently Asked Questions about medium voltage IEC fuses (CEF, CEF-VT, CEF-S, CMF, WBP, WBT) with the intent of providing typical information about the product and its applications. Please, check dedicated fuse webpage for more information. Feel free to contact ABB for any further question or material.

**1. What is the fuse ?**

Fuse is the protective device that by the melting of one of its components (fuse-link) opens the circuit by breaking the current when this exceeds a given value for a sufficient time. According to standard when we say fuse we refer to composition of fuse- base (supporting device designed to mount fuse-link in secure position) and fuse-link, however in common language fuse terminology may refer to fuse-link only.

Fuse-link is a type of low resistance resistor that acts as a sacrificial device to provide overcurrent protection, of either the load or short-circuit. Its essential component is a metal wire or strip that melts when too much current flows through it, interrupting the circuit that it connects. Short circuits, overloading, mismatched loads, or device failure are the prime reasons for excessive current.

**2. What is fuse application?**

Fuses are commonly used protective devices against overload conditions. They can be used as sole component or in combination with other switching apparatus like switch-disconnector, contactor, breaker.

**3. What is striker pin**

The striker pin is mechanical compound of the fuse-links that is automatically released when fuse operates. It has sufficient energy required to cause operation of combined apparatus or to provide interlocking. It has indication function as well when no

other switching apparatus is combined with the fuses. The strikers are classified by the amount of energy they are able to deliver to a mechanical switching devices and by minimum withstand force. Therefore we have Light, Medium and Heavy strikers. The most common are Medium (1 +/- 0.5 J and 16-40 mm travel range) and Heavy (2 +/-1 J with 10-16 mm travel distance) types.

4.

**What is thermally operated striker?**

Originally striker is activated by overload current during fuse-link operation and this applies for all striker designs. However thermally operated strikers can be activated by exceeding defined level of temperature measured in specific place around or inside the fuse-link.

5.

**What is TCU?**

The TCU means Temperature Control Unit and it is thermal trigger? incorporated into CEF, CEF-S, CEF-VT and CMF series fuse-links design. It is activated when the allowable temperature in the switchgear is exceeded. When the temperature is too high the TCU activates the striker by releasing the switch-disconnector, which in turn opens the electric circuit and avoids further temperature increases.

6.

**What BS stands for?**

The IEC fuse-links have two types of connections – the DIN with round terminals connectable by fuse clips and with flat connectors that are commonly known as BS tags. The BS tags are fixed to the base by the screws and exists in four different dimensional standards (A, B, C, D).

7.

**What kind of fuse-links can be used for ABB switch-disconnectors?**

The switching apparatus like switch-disconnectors may be automatically opened by fuse tripping system, when fuse-links striker pin is released. The main benefits coming out of that is that switch-disconnector breaking capabilities can be extend up to braking performance of applied fuse-link, when we follow the IEC switch-fuse combination standard like IEC 62271-105. This means that ABB NALF switch-disconnector can be rated up to 63 kA breaking current when combining with ABB CEF fuses. The same applies for GSec load break switch. However this applies to switch combination with reference fuses that are type tested according to mentioned standard only. The CEF series fuses are reference fuses for both NALF and GSec therefore they are recommended for these switching apparatus. The same rules apply for all panels with switching apparatus like RMU, switchgears etc.

8.

**Can we use fuses out of reference list for switch-fuse combination?**

This is not recommended by IEC standard and may lead to unpredictable behavior of combination during switching overload currents above breaking capability of the switch. Therefore the fuse-links from switch manufacturer reference list should be used. The use of other fuse-links is still possible but they must meet all the requirements presented in IEC 62271-105 standard for extension of reference list of fuse-links.

9.

**Can I use fuse-links of different brands in the same three phase fuse-base?**

This is not recommended since each fuse-link brand have unique time-current characteristic that determines fuse performance in case of overload conditions.

10.

**Are IEC medium voltage fuse-links kind of commodities with easy replacement rules?**

The medium voltage IEC fuses does not have all important performance data predefined by IEC standard therefore replacement of specific fuse-link coming from manufacturer A to fuse-link from manufacturer B requires deep technical study of fuse-links data and application knowledge. Many cross-reference table can provide misleading information about fuse-link replacement since they neither consider critical product characteristic nor refers to specific fuse application. Therefore it is recommended to follow either switch manufacturer reference fuse tables or to analyze application requirements to find out suitable fuse-link type in case of existing one.

11.

**What is difference between full-range and back-up fuses?**

Both full-range and back-up fuses are current limiting fuses, it means that may reduce prospective value of short circuit current in a significant way. The full-range fuses operating range starts from lower overload current in comparison to back-up fuses that makes them more suitable for a sole protection application. The back-up fuses are commonly used in combination with switches and contactors where the fact of fuse-link capability to interrupt smaller overload currents does not provide any benefits. The low overload currents are naturally interrupted faster by the switch in comparison to fuses time-current characteristic.

12.

**What is time-current characteristic of fuse-link?**

The IEC fuse-links have their specific breaking performance that shows fuse-link operational time in relation to value of overload current. This is called time-current characteristic and determines fuse selection especially for distribution transformer protection.

13.

**Is each and every ABB fuse-link tested for tightness in production process?**

Every single ABB fuse-links CEF, CEF-S, CEF-VT and CMF must pass special tightness test on production line, as a part of routine test.

14.

**What is scope of CFA campaign?**

Special price discount for selected types of IEC current limiting fuses supplied by PLABB location in Przasnysz, Poland: CEF, CEF-S, CMF, CEF-VT and WBP with their accessories.

15.

**What is difference between current-limiting and expulsion fuses?**

The current-limiting fuse, during and by its operation in a specified current range, limits the current to a substantially lower value than the peak value of the prospective current, whereas expulsion fuses allow prospective current to achieve its peak value. Therefore current-limiting fuses offer significantly higher protection level, benefiting in extension of protected circuit life time

16.

**What customer benefits are coming with ABB fuses?**

ABB IEC current-limiting fuses extend protected installation's life time, reduce energy consumption during fuse operation, protect environment by reducing failure mode of fuse installation place, reduce cost of spare items.

17.

**Can ABB fuse be applicable into RMU?**

Operating conditions inside RMU are more demanding vs. open air application for fuses, due to limited heat dissipation inside fuse canister, that is placed inside RMU structure and closed during normal operation. Therefore, distribution utilities typically request fuses with build in features, that ensures interruption of supply before excessive heat damages the canister. All ABB CEF, CEF-S, CEF-VT and CMF series have this feature incorporated in the fuse design as combination of TCU and overload spots.

18.

**What are overload spots?**

This product design feature, recognized as M-effect commonly, comes from professor Metcalf discovery. The M-effect is used to create this overload spot which is made by coating the silver fuse elements with a short segment of a metal which is characterized by a low melting point. It takes advantage of the effect of the melting of metals characterized by a higher melting point (e.g. copper, silver) by some metals in a liquid state which are characterized by a low melting point (e.g. tin, lead). Silver fuse elements coated with a segment of a metal with a low melting point (e.g. solder) fuse for current values that would otherwise not cause fusing if the overload spot were not present. This allows to reduce temperature of fuses during interruption, to initiate arc in the most favorable points and to interrupt smaller currents.

19.

**Why ABB fuses use combination of TCU and overload spots?**

The combination of overload spots and thermal striker pin offers improved protection level for application in both open and closed environment. The overload spots contribute in typical overload conditions, since their action is related to overload current mostly and when temperature generated inside fuse body, initiates melting process in overload spots, that results in releasing striker pin and cutting off load current. The TCU benefits in situation around fuses, exceeds when heat generated by load current accumulated safety level for keeping fuses within their healthy operational conditions and consequently striker pin is released. So, the combination of these two features offers balanced protection against too high operating temperature of fuse, protecting installation place from fuse overload condition consequences.

20.

**Is combination of overload spots and thermal striker pin common for fuse designs?**

ABB design of current-limiting fuses is quite unique in the fuse market. Other designs are based either on pure silver tape with thermal striker pin or on silver tape with overload spots. It is worth to say that for designs based on silver tape without overload spots, thermal striker pin looks to be "must" conditions for modern installations inside RMU, whereas for ABB fuses thermal striker pin (TCU) was added to standard design with overload spots, as extension of existing thermal protection functionality.

21.

**Why we call CEF-S fuse-links fast acting?**

The CEF-S provides much faster overload currents interruption performance for the range of 100ms and that is why we call them fast acting fuses. The use of CEF-S fuses significantly improves protection sensitivity for distribution transformer in case of secondary side short circuit currents that can be controlled by medium voltage side fuse-link operation. The ABB CEF-S fuse-links are available from 6 kV up to 40.5 kV nominal voltages.

22.

**What back-up means in fuse terminology?**

Back-up is one of the classes of current-limiting fuse-links. Fuses of that class are typically applied in series with another switching component usually characterized by a limited current interrupting ability. Fuses in a sense, "backing up" this other switching device by current limitation in case of short-circuit and by increasing breaking capability. Back-up fuses, under specified conditions of use, are capable of break all currents from the rated maximum breaking current down to the rated minimum breaking current.

23.

**Are ABB fuse-links suitable for 60 Hz application?**

ABB IEC fuse-links that meet IEC 60282-1 standards, are subject to the test procedure according to which the frequency range is between 48 Hz and 62 Hz.

24.

**What is fuse-link derating?**

Derating indicates the possible value of current that can be carried by fuse-link in the given condition (of surrounding temperature), in which its permissible temperatures will not be exceeded. Derating usually refers to installations with high ambient temperature (above 40°C), or where the installation has a limited ability to take heat from the fuse.

25.

**What is the meaning of CEF, CEF-S, CEF-VT, CMF product lines?**

CEF - Essential fuse-links for distribution transformers and capacitor protection

CEF-S - Fast-acting fuse-links for protection of distribution transformers

CEF-VT - fuse-links for voltage transformer protection

CMF - fuse-links for motor circuit protection

26.

**How can we measure fuse resistance on site?**

The resistance can be measured with a basic multimeter or ohmmeter (the reference measurement takes place at a temperature of 20 °C).

27.  
**Whether indoor/outdoor fuse-link designation means we can use fuse-links in both indoor and outdoor operating conditions?**

Yes, indoor/outdoor designation indicates that the fuse-link is designed both for indoor and outdoor installations. Sealed and watertight fuses are recommended for most applications, as non-susceptible to high humidity or condensation phenomena.

28.  
**What is temperature limit to release striker pin by TCU?**

TCU is withstanding temperatures up to 125°C (+/-10%) on the fuse end-cap. No operation up to that temperature value.

29.  
**Are the fuse-links with 63 kA breaking capacity suitable for installation with lower requirements?**

Yes, fuse-links of a 63kA breaking capacity are applicable for installations where 63kA or lower level of breaking capacity is required, e.g. 50kA, 40kA, 16kA etc.

30.  
**What double marking of fuse-link voltage means (e.g. 3/7.2 kV)?**

ABB uses two voltage values to mark fuse-links, e.g. 3/7.2 kV, reflecting the minimum and maximum voltage of application, which means the fuse-link marked as 3/7.2 kV can operate in the grid at voltages from 3 kV to 7.2 kV, meeting the conditions that are specified by the relevant standard.

The higher value from this marking represents the "rated voltage" defined by the fuse standard IEC 60282-1. Rated voltage of the fuse-link is the maximum voltage at which the fuse-link can operate in a three-phase network.

31.  
**What DIN size means?**

DIN size, describes the external dimensions of fuses, DIN fuses have a contact diameter of 45mm, and the series of lengths are 192mm, 292mm, 442mm, 537mm depends on voltage. The current fuse standard IEC 60282-1 has taken over the requirements in this respect from the previous DIN 43625 standard.

32.  
**What does HRC fuse-link means?**

HRC stands for high rupturing capacity fuses. The term used for fuses, of a closed housing with high breaking capacity and with melting performance according to characteristic. In the face of the emergence of numerous designs and principles of operation, it became too general and not included in HV fuse standards nomenclature. For high-voltage fuses in the technical nomenclature, the appropriate and currently used terms more precisely define the fuse's operating principle, e.g. current-limiting back-up fuses.

33.  
**What is difference between CEF and CEF-S?**

CEF is a typical and essential product for the protection of transformers and capacitors. It has the largest current and voltage range of all ABB fuse families. CEF-S is a product that meets special requirements for the time-current characteristic providing much faster overload currents interruption performance for the range of 100ms (mainly users of the Swedish market). That is why, CEF-S called fast acting fuses.

34.  
**Can I use CMF in NALF switch-fuse combination?**

Fuses that can be used with NALF are presented on the reference list in the NAL catalog and manual. CMF is not on the reference list.

35.  
**Why there is a limitation of allowable fuse-link rated current for switch-fuse combination like NALF?**

Limitations result mainly from thermal conditions and current coordination according to standard IEC 62271-105.

36.  
**Can I use fuse-links from other suppliers with NALF switch-fuse combination?**

It is recommended to use fuses from reference list, which presents the fuses that has been tested and approved for usage with

NALF. Extension of the reference list to be conducted according to IEC 62271-105 guidance.

**37.**

**What is minimum order q-ty for fuse-links?**

Minimum order quantity is one piece, however it is recommended to replace all 3 fuses in 3 phase installations, even if only one is blown.

**38.**

**Can I use fuse-links with different ratings in three phases installation?**

It is recommended to use fuses of the same brand/type and rating in three phases installation. If you want to replace fuses with ratings other than installed ones, the selection must be verified and the specificity of the application must be taken into account.

—

More product information: [abb.com/mediumvoltage](http://abb.com/mediumvoltage)

Your contact center: [abb.com/contactcenters](http://abb.com/contactcenters)

More service information: [abb.com/service](http://abb.com/service)

All rights reserved. Data and illustration without engagement. We reserve the right to make changes in the course of technical development.

© Copyright 2021 ABB. All rights reserved.