## FUSES

Catalogue



## INTRODUCTION

The main function of current limiting fuses is to protect electrical apparatus like distribution transformers, motors, capacitor banks against overload currents. The fuses can operate as sole devices or can be combination with air/SF6 insulated switch disconnector. The choice depends on each application requirements and specific network conditions. One of critical aspects for optimum protection results is proper fuses selection. This can be done based on theoretical calculation but we see many times practical knowledge coming from real test results could make it easier and even more reliable. ABB as the company with wide apparatus product portfolio has long time experience in this field. Our current limiting fuses were designed for safety operations in open air and for limited heat dissipation installation like we find in gas insulated switchgears.

Fuse selection principles for most common situations are presented on the following pages all together with common definitions. Moreover we offer our support for each specific case where presented criteria are not sufficient.

So, before using our products we want to encourage you to read below presented technical definitions and application principles.

## MAIN DEFINITIONS

## Current limiting back up fuses

Current limiting fuses family is generally composed of three different fuses groups: back-up fuses, general purpose fuses and full range fuses. All of them limit value of prospective short circuits currents during interruption process extending life time of nearby installed electrical equipment. The main difference is in minimum breaking current that characterize lowest fault current that fuses are capable to interrupt. This value is regularly highest for back up fuses, slightly smaller for general purpose and smallest with the value nearby minimum melting current for full range fuses. But for the protection function reaction time is critical. That is why back up fuses having interruption time for their minimum breaking current in the range of few seconds up to few tens of milliseconds are the most common in use. The total clearing time in case of high value of short circuits currents is even shorter i.e. few ms only. That is why back up fuses can be used as typical overload protection element. Whereas general purpose and full range fuses even capable to interrupt smallest values of currents can be considered as over current devices only since the interruption time is 1 hour and more. ABB current limiting fuses have minimum breaking currents at very low level nearby $3 \times \mathrm{ln}$.

## M-effect

One of the structural means used for forming the time-current characteristic of medium voltage fuse links of CEF and CMF series, manufactured by ABB, is an overload spot located on fuse elements. To create this overload spot the M -effect is used. The overload spot is made by coating the silver fuse elements with a short segment of metal characterized by a low melting point. For the first time the M-effect was described by professor Metcalf in the 1930s. It consists in taking advantage of the effect of melting by some metals characterized by a low melting point (e.g. tin, lead) and being in a liquid state, metals characterized by a higher melting point (e.g. copper, silver). Silver fuse element coated with a segment of metal a low melting point metal (solder) fuses for current values that would not fuse it if the overload spot were not present. The reason for it is as follows: During heating of the fuse element with the overload spot, the metal, which the overload spot is made of, starts melting and diffuses into the metal of the fuse element and thus reduces the active cross-section of the main silver fuse element. As a result of this silver fuse element is melted at the moment when the other parts of the fuse element still keep a relatively low temperature. With this design the overload spot enables reduction of the minimum melting current and reduction of the minimum breaking current. Consequently, the range of correct operation of the fuse link is extended. One must also emphasize that in case of short-circuit currents, when fuse elements are heating up very fast and practically no heat is dissipated into the surrounding arc-quenching medium (adiabatic heating), the fuse elements melt at the constrictions before metal, which the overload spot is made of, reaches its melting temperature. Therefore, the overload spot does not affect the fuses characteristic for short-circuit currents. Additionally, a very important advantage of using the overload spot is the fact that the arc is always initiated at the same point on the fuse element, near the geometrical center of the fuse link. This solution prevents the arc from initializing near one of the end-caps, which could result in damaging of the end-cap by the arc. To sum up, the overload spot enables increase in the useful operational range of the fuse link by extending the range of correct operation for small overload currents. Moreover, use of the overload spot prevents the arc from initializing near one of the fuse link ends and, thus, makes the fuse link safer to use.

## Fuse-switch combination

Back up fuses are commonly used for fuse-switch combinations both in open air and in gas insulated panels. When fuses operates as protective device incorporated with switch by tripping system we need to consider two different function of fuses depending on interrupted current value. When fault current is above transfer current, fuses simply extend breaking capability of switch disconnector completing interruption operation always faster than incorporated switch. This happens for fuse clearing time is shorter than total opening time of LBS. When striker pin pops up fuses have already cleared current and switch opens in almost no load conditions. Other situation is when fault currents are below nominal transfer current. The main role of fuses is to activate tripping system of switch by striker pin. In this case interruption process is completed by
switch first preventing fuses from overload in case of low fault current. Fuses that are to be used for fuseswitch combination have to fulfill conditions presented in IEC 62271-105 (former IEC 60420 and IEC 420). Back up fuses are specially designed for such an application. Use of general purpose or full range fuses for fuse switch combination is not reasonable due to coordination principles.

## GENERAL PRINCIPLES FOR FUSE LINKS SELECTION

## Choice of rated current In

To obtain the best possible current limitation, and thereby also protection, In must be chosen as low as possible compared to the rated current of the object to be protected. However, the following limitations must be taken into consideration:

- the largest load current must not exceed In;
- cooling conditions (e.g. in compact switchgear);
- inrush current of off load transformers;
- starting currents of motor circuits. (See Chapter CMF, special motor fuses).


## Protection of capacitor banks

HRC fuses are normally connected in series with capacitor unit or banks and they are to isolate when units become faulty under normal operating voltages including transient voltage during energizing of capacitors. That is why the chosen fuse links' rated voltage should be not less than 1,1 of rated voltage of capacitor unit and rated current of the fuse should be at least 1,43 of capacitor rated current as it recommended in IEC 60549. In practice we can distinguish two general cases;

## Only one capacitor bank connected

Select rated current In for fuses at least 2 times of rated current Inc of capacitor bank and rated voltage Un higher than Unc.
In $\geq 2 x \operatorname{lnc}$
Un $\geq 2 x$ Unc

## Example

315 kVAr capacitor bank with 10 kV Unc.
Inc $=\frac{315}{10 \times \sqrt{ } 3}=18,2 \mathrm{~A}$
Selected fuses: $\mathrm{In}=40 \mathrm{~A}$; Un $=24 \mathrm{kV}$
More than one capacitor connected in parallel
Including possibility of reloading i.e. transmitting from load capacitor bank to unloaded it must be considered that very high transient current may occur.
Select In of fuses to be more than 3 times of Inc for capacitor banks. And due to wide variations of transient currents may occur it is recommended to consult calculation with supplier of capacitors.

## Application in SF6 switchgears

CEF fuses were designed in relation to application inside gas insulated switchgears. The coordination of fuses with switch disconnector when limited heat dissipation conditions occur is not easy task. This is part of knowledge obtained mainly from many practical tests performed in different loading conditions.

First we should define maximum allowed value of power losses for fuses not to exceed temperature rise limits according to referred standard. This results in de-rating of rated current of fuses having power losses above this limit to safety level with clear assumption of fuse load factor. All this procedure should be verified by temperature rise and breaking tests and this is ABB standard approach for SF6 switchgear and CEF fuses.
For detailed information regarding choice of ABB fuses for transformer protection in SF6 switchgear please refer to switchgear catalogue data.

## Replacement of melted fuse links

HRC fuse links cannot be regenerated. According to IEC Publication 602821 (IEC 282-1), all 3 fuse links should be replaced, even if only one of them in three phase system have operated. Exceptions are allowed when it can be verified that the fuse link(s) have not experienced any over current.

## INDICATOR AND STRIKER PIN

CEF and CMF fuses are equipped with combined indicator- and striker system, which is activated immediately when the fuse element melts. CEF-VT is available with and without striker pin - please refer to ordering tables. The force diagram is in accordance with the requirements of IEC 60282-1 (IEC 282-1) and DIN 43625.

The bellow presented striker pin force diagram is valid for CEF/CMF fuses as effective from May 2006. The former version of striker pin was with initial force of 50N.


## NAMEPLATE

The symbols on the nameplate have the following meaning:
$I_{N}=$ Rated current
$\mathrm{U}_{\mathrm{N}}=$ Rated voltage
$\mathrm{I}_{3}=$ Minimum breaking current
$I_{1}=$ Maximum short circuit current for which the fuse is tested
The arrowhead on the nameplate indicates in which end of the fuse link the indicator and striker pin appears. Additionally this end contact of the fuse link is specially marked.
CEF-U is outdoor type.


The above nameplate is example one for ABB CEF fuses and the information presented there could be different for specific fuse type.

All CEF and CMF fuses ere marked with EAN 13 codes (on their cartoon boxes) that are specified in ordering tables right to catalogue numbers. The example of this name plate is presented below.


## CURRENT LIMITATION

All presented ABB fuse links are current limiting ones. A large short circuit current will therefore not reach its full value. The cut-off characteristics shows the relation between the prospective short circuit current and the peak value of the cut-off current. Substantial current limitation results in a considerable reduction of the thermal and mechanical stress on the high voltage installation.

## High voltage current limiting

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## High voltage current limiting

## fuse links type CEF

## Rated voltage: 3,6/7,2-36 kV Rated current: 6-200 A

## 1. GENERAL

The HRC generation of fuse link type CEF are designed and tested according to IEC Publication 60282-1 (IEC 282-1). Dimensionally the fuse links are in accordance with DIN 43625.
ABB's high voltage fuse links have the following properties:

- Low minimum breaking current
- Low power losses
- Low arc-voltage
- High breaking capacity up to 63 kA
- High current limitation.

Low power losses permit installation of these fuse links in compact switchgear.
CEF fuses are of back-up type. They have a zone between the minimum melting current and the minimum breaking current where the fuse links may fail to interrupt.
For CEF fuse links this zone is very narrow. The minimum breaking current $I_{3}$ for any type is specified in the table on p. 13 and 14.

## 2. OVERVOLTAGES

In order to be current limiting, the fuse link must generate an arc-voltage exceeding the instantaneous value of the operating voltage. The switching voltage generated by the CEF fuse link is below the maximum permissible value acc. to IEC 60282-1 (IEC 282-1). The CEF fuse link can safely be used if the system line voltage is $50-100 \%$ of the rated fuse link voltage.

## 3. PRE-ARCING TIMES AND CUT-OFF CHARACTERISTICS

The characteristics are equal for all rated voltages and are recorded from cold condition.
Dashed sections of the curves indicate the zone of uncertain interruption.


## High voltage current limiting



Prospective cureent [kA] (rms)

## 4. CHOICE OF FUSE LINKS

## Choice of rated current $I_{N}$

For the choice of rated current of fuse links for protection of transformers, the relation between the power rating of the transformers, operating voltage and rated current of the fuse link is given in the table below. The same table indicates the highest rated current of the low voltage fuse link (on the low voltage side of the transformer) which gives discrimination with the high voltage fuse link. The low voltage fuse link is of the type gL (VDE) or gG/ gM(IEC).
For choice of fuse links for transformer protection in switchgear of type Safe Plus or Safering CTC-F, see SF Insulated Compact Switchgear and Ring Main Unit catalogue.

## High voltage current limiting

## fuse links type CEF

Choice of fuse links for protection of transformers

| Line voltage [kV] | TRANSFORMER RATING (kVA) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 25 | 50 | 75 | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3000 | 3500 |
|  | HIGH VOLTAGE FUSE-LINK $\mathrm{I}_{\mathrm{n}}$ (A) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | 16 | 25 | 25 | 40 | 40 | 63 | 63 | 63 | 80 | 100 | 100 | 160 | 200 | 200 | 250* | 315* |  |  |  |  |
| 5 | 10 | 16 | 25 | 25 | 25 | 40 | 40 | 63 | 63 | 63 | 80 | 100 | 100 | 160 | 200 | 200 | 250* | 315* | 315* |  |
| 6 | 10 | 16 | 16 | 25 | 25 | 25 | 40 | 40 | 63 | 63 | 63 | 80 | 100 | 100 | 160 | 200 | 200 | 250* | 315 | 315* |
| 10 | 6 | 10 | 16 | 16 | 16 | 25 | 25 | 25 | 31,5 | 40 | 63 | 63 | 63 | 80 | 100 | 100 | 160 | 200 | 250* | 250* |
| 12 | 6 | 10 | 16 | 16 | 16 | 16 | 25 | 25 | 25 | 31,5 | 40 | 63 | 63 | 63 | 80 | 100 | 160 | 160 | 200 | 250* |
| 15 | 6 | 10 | 10 | 16 | 16 | 16 | 16 | 20 | 25 | 25 | 31,5 | 40 | 63 | 63 | 63 | 100 | 100 | 125 | 200 | 200 |
| 20 | 6 | 10 | 10 | 10 | 16 | 16 | 16 | 20 | 20 | 20 | 31,5 | 31,5 | 40 | 63 | 63 | 63 | 80 | 100 | 125 | 160 |
| 24 | 6 | 10 | 10 | 10 | 10 | 16 | 16 | 20 | 20 | 20 | 31,5 | 31,5 | 40 | 40 | 63 | 63 | 63 | 80 | 125 | 125 |
| 30 | 6 | 10 | 10 | 10 | 10 | 10 | 16 | 16 | 16 | 16 | 25 | 25 | 25 | 40 | 40 | 40 | 2x40 | 2x40 |  |  |
| 36 | 6 | 10 | 10 | 10 | 10 | 10 | 10 | 16 | 16 | 16 | 16 | 25 | 25 | 25 | 40 | 40 | 2x40 | 2x40 |  |  |
| $\begin{array}{\|c\|} \hline \text { Low } \\ \text { voltage } \end{array}$ | LOW VOLTAGE FUSE-LINK $\mathrm{I}_{\mathrm{n}}(\mathrm{A})$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 220 V |  | 80 | 100 | 125 | 160 | 200 | 250 | 250 | 315 | 400 | 500 | 630 |  |  |  |  |  |  |  |  |
| 380 V |  | 50 | 63 | 100 | 100 | 125 | 125 | 200 | 250 | 250 | 350 | 400 | 400 | 500 | 630 |  |  |  |  |  |
| 500 V |  | 40 | 50 | 80 | 80 | 100 | 100 | 160 | 160 | 200 | 250 | 350 | 350 | 400 | 500 | 630 |  |  |  |  |

*) CMF -fuse link

Presented values were calculated for free air conditions and $120 \%$ overload factor for protected transformers. If other conditions apply given vales should be recalculated considering real situation.

## High voltage current limiting

fuse links type CEF

## 5. ORDERING TABLE

High-voltage - HRC fuse links

| Type | Rated voltage Un [kV] | Rated current [A] | Length e [mm] | Diameter D [mm] | Catalogue No. | EAN13 Codes | Weight [kg] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 3,6/7,2 | 6 | 192 | 65 | 1YMB531001M0001 | 5901436020011 | 1,5 |
| CEF | 3,6/7,2 | 10 | 192 | 65 | 1YMB531001M0002 | 5901436020028 | 1,5 |
| CEF | 3,6/7,2 | 16 | 192 | 65 | 1YMB531001M0003 | 5901436020035 | 1,5 |
| CEF | 3,6/7,2 | 25 | 192 | 65 | 1YMB531001M0004 | 5901436020042 | 1,5 |
| CEF | 3,6/7,2 | 40 | 192 | 65 | 1YMB531001M0005 | 5901436020059 | 1,5 |
| CEF | 3,6/7,2 | 50 | 192 | 65 | 1YMB531001M0006 | 5901436020066 | 1,5 |
| CEF | 3,6/7,2 | 63 | 192 | 65 | 1YMB531001M0007 | 5901436020073 | 1,5 |
| CEF | 3,6/7,2 | 80 | 192 | 87 | 1YMB531001M0008 | 5901436020080 | 2,6 |
| CEF | 3,6/7,2 | 100 | 192 | 87 | 1YMB531001M0009 | 5901436020097 | 2,6 |
| CEF | 3,6/7,2 | 6 | 292 | 65 | 1YMB531034M0001 | 5901436023692 | 2,3 |
| CEF | 3,6/7,2 | 10 | 292 | 65 | 1YMB531034M0002 | 5901436023708 | 2,3 |
| CEF | 3,6/7,2 | 16 | 292 | 65 | 1YMB531034M0003 | 5901436023715 | 2,3 |
| CEF | 3,6/7,2 | 25 | 292 | 65 | 1YMB531034M0004 | 5901436023722 | 2,3 |
| CEF | 3,6/7,2 | 40 | 292 | 65 | 1YMB531034M0005 | 5901436023739 | 2,3 |
| CEF | 3,6/7,2 | 50 | 292 | 65 | 1YMB531034M0006 | 5901436023746 | 2,3 |
| CEF | 3,6/7,2 | 63 | 292 | 65 | 1YMB531034M0007 | 5901436023753 | 2,3 |
| CEF | 3,6/7,2 | 80 | 292 | 87 | 1YMB531034M0008 | 5901436023760 | 3,6 |
| CEF | 3,6/7,2 | 100 | 292 | 87 | 1YMB531034M0009 | 5901436023777 | 3,6 |
| CEF | 3,6/7,2 | 125 | 292 | 87 | 1YMB531001M0010 | 5901436020103 | 3,6 |
| CEF | 3,6/7,2 | 160 | 292 | 87 | 1YMB531001M0011 | 5901436020110 | 3,6 |
| CEF | 3,6/7,2 | 200 | 292 | 87 | 1YMB531001M0012 | 5901436020127 | 3,6 |
| CEF | 3,6/7,2 | 125 | 367 | 87 | 1YMB531034M1010 | 5901436023807 | 4,4 |
| CEF | 3,6/7,2 | 160 | 367 | 87 | 1YMB531034M0011 | 5901436023784 | 4,4 |
| CEF | 3,6/7,2 | 200 | 367 | 87 | 1YMB531034M0012 | 5901436023791 | 4,4 |


| CEF | 12 | 6 | 292 | 53 | 1YMB531042M0001 | 5901436024231 | 1,9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 12 | 6 | 292 | 65 | 1YMB531002M0001 | 5901436020134 | 2,3 |
| CEF | 12 | 10 | 292 | 53 | 1YMB531042M0002 | 5901436024248 | 1,9 |
| CEF | 12 | 10 | 292 | 65 | 1YMB531002M0002 | 5901436020141 | 2,3 |
| CEF | 12 | 16 | 292 | 53 | 1YMB531042M0003 | 5901436024255 | 1,9 |
| CEF | 12 | 16 | 292 | 65 | 1YMB531002M0003 | 5901436020158 | 2,3 |
| CEF | 12 | 20 | 292 | 53 | 1YMB531042M0004 | 5901436024262 | 1,9 |
| CEF | 12 | 25 | 292 | 65 | 1YMB531002M0004 | 5901436020165 | 2,3 |
| CEF | 12 | 31,5 | 292 | 65 | 1YMB531002M0014 | 5901436020257 | 2,3 |
| CEF | 12 | 40 | 292 | 65 | 1YMB531002M0005 | 5901436020172 | 2,3 |
| CEF | 12 | 50 | 292 | 65 | 1YMB531002M0006 | 5901436020189 | 2,3 |
| CEF | 12 | 63 | 292 | 65 | 1YMB531002M0007 | 5901436020196 | 2,3 |
| CEF | 12 | 80 | 292 | 65 | 1YMB531002M0021 | 5901436020264 | 2,3 |
| CEF | 12 | 80 | 292 | 87 | 1YMB531002M0008 | 5901436020202 | 3,6 |
| CEF | 12 | 100 | 292 | 65 | 1YMB531002M0022 | 5901436020271 | 2,3 |
| CEF | 12 | 100 | 292 | 87 | 1YMB531002M0009 | 5901436020219 | 3,6 |
| CEF | 12 | 125 | 292 | 87 | 1YMB531043M0010 | 5901436024453 | 3,6 |
| CEF | 12 | 6 | 442 | 53 | 1YMB531047M0001 | 5901436024330 | 2,5 |
| CEF | 12 | 6 | 442 | 65 | 1YMB531035M0001 | 5901436023814 | 3,0 |
| CEF | 12 | 10 | 442 | 53 | 1YMB531047M0002 | 5901436024347 | 2,5 |
| CEF | 12 | 10 | 442 | 65 | 1YMB531035M0002 | 5901436023821 | 3,0 |
| CEF | 12 | 16 | 442 | 53 | 1YMB531047M0003 | 5901436024354 | 2,5 |
| CEF | 12 | 16 | 442 | 65 | 1YMB531035M0003 | 5901436023838 | 3,0 |
| CEF | 12 | 20 | 442 | 53 | 1YMB531047M0004 | 5901436024361 | 2,5 |
| CEF | 12 | 25 | 442 | 65 | 1YMB531035M0004 | 5901436023845 | 3,0 |
| CEF | 12 | 31,5 | 442 | 65 | 1YMB531035M0014 | 5901436023937 | 3,0 |
| CEF | 12 | 40 | 442 | 65 | 1YMB531035M0005 | 5901436023852 | 3,0 |
| CEF | 12 | 50 | 442 | 65 | 1YMB531035M0006 | 5901436023869 | 3,0 |
| CEF | 12 | 63 | 442 | 65 | 1YMB531035M0007 | 5901436023876 | 3,0 |
| CEF | 12 | 80 | 442 | 65 | 1YMB531035M0021 | 5901436023944 | 3,0 |
| CEF | 12 | 80 | 442 | 87 | 1YMB531035M0008 | 5901436023883 | 5,3 |
| CEF | 12 | 100 | 442 | 65 | 1YMB531035M0022 | 5901436023951 | 3,0 |
| CEF | 12 | 100 | 442 | 87 | 1YMB531035M0009 | 5901436023890 | 5,3 |
| CEF | 12 | 125 | 442 | 65 | 1YMB531002M0023 | 5901436020288 | 3,0 |
| CEF | 12 | 125 | 442 | 87 | 1YMB531002M0010 | 5901436020226 | 5,3 |
| CEF | 12 | 160 | 442 | 87 | 1YMB531002M0011 | 5901436020223 | 5,3 |
| CEF | 12 | 200 | 442 | 87 | 1YMB531002M0012 | 5901436020240 | 5.3 |
| CEF | 12 | 125 | 537 | 65 | 1YMB531035M0023 | 5901436023968 | 4,0 |
| CEF | 12 | 125 | 537 | 87 | 1YMB531035M0010 | 5901436023906 | 6,2 |
| CEF | 12 | 160 | 537 | 87 | 1YMB531035M0011 | 5901436023913 | 6,2 |
| CEF | 12 | 200 | 537 | 87 | 1YMB531035M0012 | 5901436023920 | 6,2 |


| CEF | 17,5 | 6 | 292 | 65 | 1YMB531003M0001 | 5901436020295 | 2,3 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 17,5 | 10 | 292 | 65 | 1 YMB531003M0002 | 5901436020301 | 2,3 |
| CEF | 17,5 | 16 | 292 | 65 | 1 1YMB531003M0003 | 59001436020318 | 2,3 |
| CEF | 17,5 | 20 | 292 | 65 | 1YMB531003M0013 | 5901436020394 | 2,3 |
| CEF | 17,5 | 25 | 292 | 65 | 1YMB531003M0004 | 5901436020325 | 2,3 |
| CEF | 17,5 | 31,5 | 292 | 65 | 1YMB531003M0014 | 5901436020400 | 2,3 |
| CEF | 17,5 | 40 | 292 | 65 | 1YMB531003M0021 | 5901436020417 | 2,3 |
| CEF | 17,5 | 40 | 292 | 87 | 1YMB531003M0005 | 5901436020332 | 2,6 |
| CEF | 17,5 | 50 | 292 | 65 | 1YMB531003M0022 | 5901436020424 | 2,3 |
| CEF | 17,5 | 50 | 292 | 87 | 1YMB531003M0006 | 5901436020349 |  |
| CEF | 17,5 | 63 | 292 | 87 | 1YMB531003M0007 | 5901436020356 | 3,6 |

## High voltage current limiting

fuse links type CEF

| Type | Rated voltage Un [kV] | Rated current [A] | Length <br> e [mm] | Diameter D [mm] | Catalogue No. | EAN13 Codes | Weight [kg] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 17,5 | 6 | 367 | 65 | 1YMB531036M0001 | 5901436023975 | 2,7 |
| CEF | 17,5 | 10 | 367 | 65 | 1YMB531036M0002 | 5901436023982 | 2,7 |
| CEF | 17,5 | 16 | 367 | 65 | 1YMB531036M0003 | 5901436023999 | 2,7 |
| CEF | 17,5 | 20 | 367 | 65 | 1YMB531036M0013 | 5901436024040 | 2,7 |
| CEF | 17,5 | 25 | 367 | 65 | 1YMB531036M0004 | 5901436024002 | 2,7 |
| CEF | 17,5 | 31,5 | 367 | 65 | 1YMB531036M0014 | 5901436024057 | 2,7 |
| CEF | 17,5 | 40 | 367 | 65 | 1YMB531036M0021 | 5901436024064 | 2,7 |
| CEF | 17,5 | 40 | 367 | 87 | 1YMB531036M0005 | 5901436024019 | 4,4 |
| CEF | 17,5 | 50 | 367 | 65 | 1YMB531036M0022 | 5901436024071 | 2,7 |
| CEF | 17,5 | 50 | 367 | 87 | 1YMB531036M0006 | 5901436024026 | 4,4 |
| CEF | 17,5 | 63 | 367 | 87 | 1YMB531036M0007 | 5901436024033 | 4,4 |
| CEF | 17,5 | 100 | 367 | 87 | 1YMB531038M0001 | 5901436024224 | 4,4 |
| CEF | 17,5 | 6 | 442 | 65 | 1YMB531037M0001 | 5901436024088 | 3,0 |
| CEF | 17,5 | 10 | 442 | 65 | 1YMB531037M0002 | 5901436024095 | 3,0 |
| CEF | 17,5 | 16 | 442 | 65 | 1YMB531037M0003 | 5901436024101 | 3,0 |
| CEF | 17,5 | 20 | 442 | 65 | 1YMB531037M0013 | 5901436024187 | 3,0 |
| CEF | 17,5 | 25 | 442 | 65 | 1YMB531037M0004 | 5901436024118 | 3,0 |
| CEF | 17,5 | 31,5 | 442 | 65 | 1YMB531037M0014 | 5901436024194 | 3,0 |
| CEF | 17,5 | 40 | 442 | 65 | 1YMB531037M0021 | 5901436024200 | 3,0 |
| CEF | 17,5 | 40 | 442 | 87 | 1YMB531037M0005 | 5901436024125 | 5,3 |
| CEF | 17,5 | 50 | 442 | 65 | 1YMB531037M0022 | 5901436024217 | 3,0 |
| CEF | 17,5 | 50 | 442 | 87 | 1YMB531037M0006 | 5901436024132 | 5,3 |
| CEF | 17,5 | 63 | 442 | 87 | 1YMB531037M0007 | 5901436024149 | 5,3 |
| CEF | 17,5 | 80 | 442 | 87 | 1YMB531003M0008 | 5901436020363 | 5,3 |
| CEF | 17,5 | 100 | 442 | 87 | 1YMB531003M0009 | 5901436020370 | 5,3 |
| CEF | 17,5 | 125 | 442 | 87 | 1YMB531003M0010 | 5901436020387 | 5,3 |
| CEF | 17,5 | 80 | 537 | 87 | 1YMB531037M0008 | 5901436024156 | 6,2 |
| CEF | 17,5 | 100 | 537 | 87 | 1YMB531037M0009 | 5901436024163 | 6,2 |
| CEF | 17,5 | 125 | 537 | 87 | 1YMB531037M0010 | 5901436024170 | 6,2 |


| CEF | 24 | 6 | 442 | 53 | 1YMB531044M0001 | 5901436024279 | 2,5 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 24 | 6 | 442 | 65 | 1YMB531004M0001 | 5901436020431 | 3,0 |
| CEF | 24 | 10 | 442 | 53 | 1YMB531044M0002 | 5901436024286 | 2,5 |
| CEF | 24 | 10 | 442 | 65 | 1YMB531004M0002 | 5901436020448 | 3,0 |
| CEF | 24 | 16 | 442 | 53 | 1YMB531044M0003 | 5901436024293 | 2,5 |
| CEF | 24 | 16 | 442 | 65 | 1YMB531004M0003 | 5901436020455 | 3,0 |
| CEF | 24 | 20 | 442 | 53 | 1YMB531044M0004 | 5901436024309 | 2,5 |
| CEF | 24 | 20 | 442 | 65 | 1YMB531004M0011 | 5901436020530 | 3,0 |
| CEF | 24 | 25 | 442 | 65 | 1YMB531004M0004 | 5901436020462 | 3,0 |
| CEF | 24 | 31,5 | 442 | 65 | 1YMB531004M0012 | 5901436020547 | 3,0 |
| CEF | 24 | 40 | 442 | 65 | 1YMB531004M0005 | 5901436020479 | 3,0 |
| CEF | 24 | 50 | 442 | 65 | 1YMB531004M0021 | 5901436020554 | 3,0 |
| CEF | 24 | 50 | 442 | 87 | 1YMB531004M0006 | 5901436020486 | 5,3 |
| CEF | 24 | 63 | 442 | 65 | 1YMB531004M0022 | 5901436020561 | 3,0 |
| CEF | 24 | 63 | 442 | 87 | 1YMB531004M0007 | 5901436020493 | 5,3 |
| CEF | 24 | 80 | 442 | 87 | 1YMB531022M0001 | 5901436022688 | 5,3 |
| CEF | 24 | 100 | 442 | 87 | 1YMB531022M0002 | 5901436022695 | 5,3 |
| CEF | 24 | 125 | 442 | 87 | 1YMB531022M0003 | 5901436022701 | 5,3 |
| CEF | 24 | 80 | 537 | 65 | 1YMB531004M0023 | 5901436020578 | 4,0 |
| CEF | 24 | 80 | 537 | 87 | 1YMB531004M0008 | 5901436020509 | 6,2 |
| CEF | 24 | 100 | 537 | 87 | 1YMB531004M0009 | 5901436020516 | 6,2 |
| CEF | 24 | 125 | 537 | 87 | $1 \mathrm{YMB531004M0010}$ | 5901436020523 | 6,2 |


| CEF | 27 | 6 | 442 | 65 | 1YMB531005M0001 | 5901436020585 | 3,0 |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 27 | 10 | 442 | 65 | 1 YMB531005M0002 | 5901436020592 | 3,0 |
| CEF | 27 | 16 | 442 | 65 | 1 1YMB531005M0003 | 5901436020608 | 3,0 |
| CEF | 27 | 25 | 442 | 87 | 1 MB531005M0004 | 5901436020615 | 5,3 |
| CEF | 27 | 40 | 442 | 87 | 1 YMB531005M0005 | 5901436020622 | 5,3 |
| CEF | 27 | 50 | 442 | 87 | 1 YMB531005M0006 | 5901436020639 | 5,3 |
| CEF | 27 | 63 | 442 | 87 | $1 Y M B 531005 M 0007$ | 5901436020646 | 5,3 |
| CEF | 27 | 80 | 537 | 87 | 1YMB531005M0008 | 5901436020653 | 6,2 |
| CEF | 27 | 100 | 537 | 87 | 1YMB531005M0009 | 5901436020660 | 6,2 |


| CEF | 36 | 6 | 537 | 65 | 1YMB531006M0001 | 5901436020677 | 4,0 |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 36 | 10 | 537 | 65 | 1 YMB531006M0002 | 5901436020684 | 4,0 |
| CEF | 36 | 16 | 537 | 65 | 1 YMB531006M0003 | 5901436020691 | 4,0 |
| CEF | 36 | 25 | 537 | 87 | 1 YMB531006M0004 | 5901436020707 | 6,2 |
| CEF | 36 | 40 | 537 | 87 | 1 YMB531006M0005 | 5901436020714 | 6,2 |

Other ratings and dimensions on request. When ordering outdoor version pls. indicate CEF -U.

## High voltage current limiting

fuse links type CEF

## 6. DATA AND DIMENSIONS CEF

| Type | Rated voltage $\mathrm{U}_{\mathrm{n}}[\mathrm{kV}]$ | Rated current $\mathrm{I}_{\mathrm{n}}[\mathrm{kV}]$ | Length e [mm] | Diameter D [mm] | Short Circuit current $\mathrm{I}_{1}[\mathrm{kA}]$ | Minimum breaking current $\mathrm{I}_{3}[\mathrm{~A}]$ | Rated Power $\mathrm{P}_{\mathrm{n}}$ [W] | $\begin{aligned} & \text { Resistance } \\ & \mathbf{R}_{0}[\mathrm{mh}] \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 3,6/7/2 | 6 | 192 | 65 | 50 | 35 | 26 | 489,0 |
| CEF | 3,6/7/2 | 10 | 192 | 65 | 50 | 55 | 16 | 120,3 |
| CEF | 3,6/7/2 | 16 | 192 | 65 | 50 | 55 | 26 | 60,2 |
| CEF | 3,6/7/2 | 25 | 192 | 65 | 50 | 72 | 24 | 30,1 |
| CEF | 3,6/7/2 | 40 | 192 | 65 | 50 | 100 | 30 | 15,3 |
| CEF | 3,6/7/2 | 50 | 192 | 65 | 50 | 190 | 35 | 10,4 |
| CEF | 3,6/7/2 | 63 | 192 | 65 | 50 | 190 | 40 | 7,8 |
| CEF | 3,6/7/2 | 80 | 192 | 87 | 50 | 250 | 52 | 6,2 |
| CEF | 3,6/7/2 | 100 | 192 | 87 | 50 | 275 | 57 | 4,4 |
| CEF | 3,6/7/2 | 6 | 292 | 65 | 50 | 35 | 26 | 489,0 |
| CEF | 3,6/7/2 | 10 | 292 | 65 | 50 | 55 | 16 | 120,3 |
| CEF | 3,6/7/2 | 16 | 292 | 65 | 50 | 55 | 26 | 60,2 |
| CEF | 3,6/7/2 | 25 | 292 | 65 | 50 | 72 | 24 | 30,1 |
| CEF | 3,6/7/2 | 40 | 292 | 65 | 50 | 100 | 30 | 15,3 |
| CEF | 3,6/7/2 | 50 | 292 | 65 | 50 | 190 | 35 | 10,4 |
| CEF | 3,6/7/2 | 63 | 292 | 65 | 50 | 190 | 40 | 7,8 |
| CEF | 3,6/7/2 | 80 | 292 | 87 | 50 | 250 | 52 | 6,2 |
| CEF | 3,6/7/2 | 100 | 292 | 87 | 50 | 275 | 57 | 4,4 |
| CEF | 3,6/7/2 | 125 | 292 | 87 | 50 | 375 | 76 | 3,5 |
| CEF | 3,6/7/2 | 160 | 292 | 87 | 50 | 480 | 101 | 2,6 |
| CEF | 3,6/7/2 | 200 | 292 | 87 | 50 | 650 | 107 | 1,7 |
| CEF | 3,6/7/2 | 125 | 367 | 87 | 50 | 375 | 76 | 3,5 |
| CEF | 3,6/7/2 | 160 | 367 | 87 | 50 | 480 | 101 | 2,6 |
| CEF | 3,6/7/2 | 200 | 367 | 87 | 50 | 650 | 107 | 1,7 |


| CEF | 12 | 6 | 292 | 53 | 63 | 36 | 46 | 735,0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 12 | 6 | 292 | 65 | 63 | 35 | 41 | 735,0 |
| CEF | 12 | 10 | 292 | 53 | 63 | 65 | 25 | 180,5 |
| CEF | 12 | 10 | 292 | 65 | 63 | 55 | 33 | 180,5 |
| CEF | 12 | 16 | 292 | 53 | 63 | 65 | 34 | 105,2 |
| CEF | 12 | 16 | 292 | 65 | 63 | 55 | 32 | 105,2 |
| CEF | 12 | 20 | 292 | 53 | 63 | 83 | 38 | 70,1 |
| CEF | 12 | 25 | 292 | 65 | 63 | 77 | 47 | 52,6 |
| CEF | 12 | 31,5 | 292 | 65 | 63 | 100 | 41 | 30,7 |
| CEF | 12 | 40 | 292 | 65 | 63 | 105 | 52 | 23,0 |
| CEF | 12 | 50 | 292 | 65 | 63 | 190 | 70 | 17,9 |
| CEF | 12 | 63 | 292 | 65 | 63 | 190 | 78 | 13,4 |
| CEF | 12 | 80 | 292 | 65 | 63 | 250 | 82 | 9,2 |
| CEF | 12 | 80 | 292 | 87 | 63 | 250 | 82 | 9,2 |
| CEF | 12 | 100 | 292 | 65 | 63 | 375 | 101 | 6,4 |
| CEF | 12 | 100 | 292 | 87 | 63 | 275 | 84 | 6,6 |
| CEF | 12 | 125 | 292 | 87 | 63 | 375 | 125 | 5,1 |
| CEF | 12 | 6 | 442 | 53 | 63 | 36 | 46 | 735,0 |
| CEF | 12 | 6 | 442 | 65 | 63 | 35 | 41 | 735,0 |
| CEF | 12 | 10 | 442 | 53 | 63 | 65 | 25 | 180,5 |
| CEF | 12 | 10 | 442 | 65 | 63 | 55 | 33 | 180,5 |
| CEF | 12 | 16 | 442 | 53 | 63 | 65 | 34 | 105,2 |
| CEF | 12 | 16 | 442 | 65 | 63 | 55 | 32 | 105,2 |
| CEF | 12 | 20 | 442 | 53 | 63 | 83 | 38 | 70,1 |
| CEF | 12 | 25 | 442 | 65 | 63 | 77 | 47 | 52,6 |
| CEF | 12 | 31,5 | 442 | 65 | 63 | 100 | 41 | 30,7 |
| CEF | 12 | 40 | 442 | 65 | 63 | 105 | 52 | 23,0 |
| CEF | 12 | 50 | 442 | 65 | 63 | 190 | 70 | 17,9 |
| CEF | 12 | 63 | 442 | 65 | 63 | 190 | 78 | 13,4 |
| CEF | 12 | 80 | 442 | 65 | 63 | 250 | 82 | 9,2 |
| CEF | 12 | 80 | 442 | 87 | 63 | 250 | 82 | 9,2 |
| CEF | 12 | 100 | 442 | 65 | 63 | 375 | 103 | 6,4 |
| CEF | 12 | 100 | 442 | 87 | 63 | 275 | 84 | 6,6 |
| CEF | 12 | 125 | 442 | 65 | 63 | 375 | 125 | 5,3 |
| CEF | 12 | 125 | 442 | 87 | 63 | 375 | 125 | 5,3 |
| CEF | 12 | 160 | 442 | 87 | 63 | 480 | 170 | 3,9 |
| CEF | 12 | 200 | 442 | 87 | 50 | 650 | 174 | 2,7 |
| CEF | 12 | 125 | 537 | 65 | 50 | 375 | 125 | 5,3 |
| CEF | 12 | 125 | 537 | 87 | 50 | 375 | 125 | 5,3 |
| CEF | 12 | 160 | 537 | 87 | 50 | 480 | 170 | 3,9 |
| CEF | 12 | 200 | 537 | 87 | 50 | 650 | 174 | 2,7 |


| CEF | 17,5 | 6 | 292 | 65 | 20 | 35 | 54 | 880,0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 17,5 | 10 | 292 | 65 | 20 | 55 | 41 | 270,7 |
| CEF | 17,5 | 16 | 292 | 65 | 20 | 55 | 67 | 135,4 |
| CEF | 17,5 | 20 | 292 | 65 | 25 | 83 | 52,6 | 90,3 |
| CEF | 17,5 | 25 | 292 | 65 | 25 | 72 | 64 | 67,7 |
| CEF | 17,5 | 31,5 | 292 | 65 | 25 | 100 | 56,7 | 46,0 |
| CEF | 17,5 | 40 | 292 | 65 | 25 | 210 | 80 | 34,5 |
| CEF | 17,5 | 40 | 292 | 87 | 25 | 100 | 80 | 34,5 |
| CEF | 17,5 | 50 | 292 | 65 | 25 | 210 | 90 | 23,1 |
| CEF | 17,5 | 50 | 292 | 87 | 25 | 210 | 90 | 23,1 |
| CEF | 17,5 | 63 | 292 | 87 | 25 | 210 | 100 | 17,3 |
| CEF | 17,5 | 6 | 367 | 65 | 20 | 35 | 54 | 880,0 |
| CEF | 17,5 | 10 | 367 | 65 | 20 | 55 | 41 | 270,7 |
| CEF | 17,5 | 16 | 367 | 65 | 20 | 55 | 67 | 135,4 |

## High voltage current limiting

fuse links type CEF

| Type | Rated voltage $\mathrm{U}_{\mathrm{n}}[\mathrm{kV}]$ | Rated current $\mathrm{I}_{\mathrm{n}}[\mathrm{kV}]$ | Length <br> e [mm] | Diameter D [mm] | Short Circuit current $\mathrm{I}_{1}[\mathrm{kA}]$ | Minimum breaking current $\mathrm{I}_{3}[\mathrm{kA}]$ | Rated Power $P_{\mathrm{n}}$ [W] | $\begin{aligned} & \text { Resistance } \\ & \mathbf{R}_{0}[\mathrm{mq}] \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 17,5 | 20 | 367 | 65 | 25 | 83 | 52,6 | 90,3 |
| CEF | 17,5 | 25 | 367 | 65 | 25 | 72 | 64 | 67,7 |
| CEF | 17,5 | 31,5 | 367 | 65 | 25 | 100 | 56,7 | 46,0 |
| CEF | 17,5 | 40 | 367 | 65 | 25 | 210 | 80 | 34,5 |
| CEF | 17,5 | 40 | 367 | 87 | 25 | 100 | 80 | 34,5 |
| CEF | 17,5 | 50 | 367 | 65 | 25 | 210 | 90 | 23,1 |
| CEF | 17,5 | 50 | 367 | 87 | 25 | 210 | 90 | 23,1 |
| CEF | 17,5 | 63 | 367 | 87 | 25 | 210 | 100 | 17,3 |
| CEF | 17,5 | 100 | 367 | 87 | 25 | 375 | 134 | 9,5 |
| CEF | 17,5 | 6 | 442 | 65 | 20 | 35 | 54 | 880,0 |
| CEF | 17,5 | 10 | 442 | 65 | 20 | 55 | 41 | 270,7 |
| CEF | 17,5 | 16 | 442 | 65 | 20 | 55 | 67 | 135,4 |
| CEF | 17,5 | 20 | 442 | 65 | 25 | 83 | 52,6 | 90,3 |
| CEF | 17,5 | 25 | 442 | 65 | 25 | 72 | 64 | 67,7 |
| CEF | 17,5 | 31,5 | 442 | 65 | 25 | 100 | 56,7 | 46,0 |
| CEF | 17,5 | 40 | 442 | 65 | 25 | 210 | 80 | 34,5 |
| CEF | 17,5 | 40 | 442 | 87 | 25 | 100 | 80 | 34,5 |
| CEF | 17,5 | 50 | 442 | 65 | 25 | 210 | 90 | 23,1 |
| CEF | 17,5 | 50 | 442 | 87 | 25 | 210 | 90 | 23,1 |
| CEF | 17,5 | 63 | 442 | 87 | 25 | 210 | 100 | 17,3 |
| CEF | 17,5 | 80 | 442 | 87 | 25 | 250 | 124 | 13,8 |
| CEF | 17,5 | 100 | 442 | 87 | 25 | 275 | 136 | 9,9 |
| CEF | 17,5 | 125 | 442 | 87 | 25 | 375 | 175 | 7,9 |
| CEF | 17,5 | 80 | 537 | 87 | 25 | 250 | 124 | 13,8 |
| CEF | 17,5 | 100 | 537 | 87 | 25 | 275 | 136 | 9,9 |
| CEF | 17,5 | 125 | 537 | 87 | 25 | 375 | 175 | 7,9 |


| CEF | 24 | 6 | 442 | 53 | 63 | 25 | 82 | 1370,0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 24 | 6 | 442 | 65 | 63 | 35 | 91 | 1370,0 |
| CEF | 24 | 10 | 442 | 53 | 63 | 65 | 48 | 360,9 |
| CEF | 24 | 10 | 442 | 65 | 63 | 55 | 62 | 30,9 |
| CEF | 24 | 16 | 442 | 53 | 63 | 65 | 63 | 180,5 |
| CEF | 24 | 16 | 442 | 65 | 63 | 55 | 72 | 180,5 |
| CEF | 24 | 20 | 442 | 53 | 63 | 83 | 46 | 120,3 |
| CEF | 24 | 20 | 442 | 65 | 63 | 82 | 61 | 120,3 |
| CEF | 24 | 25 | 442 | 65 | 63 | 72 | 79 | 90,2 |
| CEF | 24 | 31,5 | 442 | 65 | 63 | 82 | 98 | 72,2 |
| CEF | 24 | 40 | 442 | 65 | 63 | 110 | 106 | 46,0 |
| CEF | 24 | 50 | 442 | 65 | 63 | 210 | 130 | 30,7 |
| CEF | 24 | 50 | 442 | 87 | 63 | 210 | 130 | 30,7 |
| CEF | 24 | 63 | 442 | 65 | 63 | 250 | 147 | 23,0 |
| CEF | 24 | 63 | 442 | 87 | 63 | 210 | 147 | 23,0 |
| CEF | 24 | 80 | 442 | 87 | 63 | 250 | 165 | 18,4 |
| CEF | 24 | 100 | 442 | 87 | 63 | 300 | 186 | 15,4 |
| CEF | 24 | 125 | 442 | 87 | 63 | 375 | 234 | 10,5 |
| CEF | 24 | 80 | 537 | 65 | 63 | 250 | 165 | 18,4 |
| CEF | 24 | 80 | 537 | 87 | 63 | 250 | 165 | 18,4 |
| CEF | 24 | 100 | 537 | 87 | 63 | 300 | 186 | 13,2 |
| CEF | 24 | 125 | 537 | 87 | 63 | 375 | 234 | 10,5 |


| CEF | 27 | 6 | 442 | 65 | 20 | 35 | 91 | 1340,0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 27 | 10 | 442 | 65 | 20 | 55 | 80 | 451,2 |
| CEF | 27 | 16 | 442 | 65 | 20 | 55 | 90 | 225,6 |
| CEF | 27 | 25 | 442 | 87 | 20 | 72 | 100 | 112,8 |
| CEF | 27 | 40 | 442 | 87 | 20 | 110 | 130 | 55,6 |
| CEF | 27 | 50 | 442 | 87 | 20 | 210 | 130 | 30,7 |
| CEF | 27 | 63 | 442 | 87 | 20 | 210 | 147 | 23,0 |
| CEF | 27 | 80 | 537 | 87 | 20 | 250 | 210 | 18,4 |
| CEF | 27 | 100 | 537 | 87 | 20 | 300 | 235 | 15,8 |


| CEF | 36 | 6 | 537 | 65 | 20 | 35 | 137 | 2055,0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF | 36 | 10 | 537 | 65 | 20 | 55 | 971,5 |  |
| CEF | 36 | 16 | 537 | 65 | 20 | 55 | 109 |  |
| CEF | 36 | 25 | 537 | 87 | 20 | 72 | 144 | 142,8 |
| CEF | 36 | 40 | 537 | 87 | 20 | 100 | 176 | 69,1 |

$I_{1}=$ maximum short-circuit current tested
$I_{3}=$ minimum breaking current
$\mathrm{P}_{\mathrm{N}}=$ power loss at rated current
$R_{o}=$ resistance at room temp.


## High voltage current limiting

fuse links type CEF

## 7. ACCESSORIES

Fuse base type UCE


## 8. ORDERING TABLE

| Type | Rated voltage | Current ratings | Fuse length | Dimensions in mm |  |  |  |  |  |  | Weight | Catalogue No. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | kV | A | mm | A | A1 | A2 | H | K | K1 | B | kg |  |
| UCE 7,2 | 3,6/7,2 | 6-100 | 192 | 242 | 160 | 221 | 310 | 218 | 193 | 55 | 3,4 | 1YMX052501M0001 |
| UCE12 | $\frac{3,6 / 7,2}{12}$ | $\frac{6-200}{6-125}$ | 292 | 242 | 160 | 221 | 410 | 318 | 293 | 180 | 3,7 | 1YMX052503M0001 1YMX052503M0001 |
| UCE 12L | 12 | 125-200 | 442 | 242 | 160 | 221 | 570 | 468 | 443 | 300 | 4,2 | 1YMX052505M0001 |
| UCE 17,5 | 17,5 | 6-63 | 292 | 327 | 245 | 306 | 410 | 318 | 293 | 180 | 3,7 | 1YMX052507M0001 |
| UCE 24 | $\frac{17,5}{24}$ | $\frac{6-125}{6-125}$ | 442 | 327 | 245 | 306 | 570 | 468 | 443 | 300 | 6,9 | 1YMX052509M0001 1YMX052509M0001 |
| UCE 24L | 24 | 80-125 | 537 | 327 | 245 | 306 | 675 | 563 | 538 | 380 | 7,4 | 1YMX052511M0001 |
| UCE 36 | 36 | 6-40 | 537 | 422 | 340 | 401 | 675 | 563 | 538 | 380 | 7,6 | 1YMX052513M0001 |

CEF test fuse-link 3,6/7,2-36 kV for test of striker system.

| Catalogue No. | Weight <br> $[\mathrm{kg}]$ | Dimension in mm |  |
| :---: | :---: | :---: | :---: |
|  |  | $\mathrm{e}^{*}$ | Total lenght |
|  |  | 192 |  |
| 1YMХ300062M0001 | 1,4 | 292 | 605 |
|  |  | 442 |  |

*) Adjustable
The striker has a force-travel characteristic as shown in the figure on page 6.
Operating tong for fuse links CEF 3,6/7,2-36 kV

| Catalogue No. | Test voltage <br> $[\mathrm{kV}]$ | Weight <br> $[\mathrm{kg}]$ |
| :---: | :---: | :---: |
| 1YMX053006M001 | 100 | 2,2 |


| Dimensions in mm |  |  |
| :---: | :---: | :---: |
| L1 | L2 | A3( () |
| 700 | 600 | $30-90$ |



## High voltage current limiting

## fuse links type CEF

## 9. DATA AND DIMENSION CEF-BS

| Type | Rated voltage [kV] | Rated current [A] | L/D <br> [mm] | $\begin{gathered} \mathrm{A} \\ {[\mathrm{~mm}]} \end{gathered}$ | Catalogue No. | EAN13 Codes |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF-BS | 3,6/7,2 | 6 | 305/65 | 340 | 1YMB531007M0001 | 5901436020721 |
| CEF-BS | 3,6/7,2 | 10 | 305/65 | 340 | 1YMB531007M0002 | 5901436020738 |
| CEF-BS | 3,6/7,2 | 16 | 305/65 | 340 | 1YMB531007M0003 | 5901436020745 |
| CEF-BS | 3,6/7,2 | 25 | 305/65 | 340 | 1YMB531007M0004 | 5901436020752 |
| CEF-BS | 3,6/7,2 | 40 | 305/65 | 340 | 1YMB531007M0005 | 5901436020769 |
| CEF-BS | 3,6/7,2 | 50 | 305/65 | 340 | 1YMB531007M0006 | 5901436020776 |
| CEF-BS | 3,6/7,2 | 63 | 305/65 | 340 | 1YMB531007M0007 | 5901436020783 |
| CEF-BS | 3,6/7,2 | 80 | 305/87 | 340 | 1YMB531007M0008 | 5901436020790 |
| CEF-BS | 3,6/7,2 | 100 | 305/87 | 340 | 1YMB531007M0009 | 5901436020806 |
| CEF-BS | 3,6/7,2 | 125 | 405/87 | 440 | 1YMB531007M0010 | 5901436020813 |
| CEF-BS | 3,6/7,2 | 160 | 405/87 | 440 | 1YMB531007M0011 | 5901436020820 |
| CEF-BS | 3,6/7,2 | 200 | 405/87 | 440 | 1YMB531007M0012 | 5901436020837 |
| CEF-BS | 12 | 6 | 405/65 | 440 | 1YMB531008M0001 | 5901436021179 |
| CEF-BS | 12 | 10 | 405/65 | 440 | 1YMB531008M0002 | 5901436021186 |
| CEF-BS | 12 | 16 | 405/65 | 440 | $1 \mathrm{YMB531008M0003}$ | 5901436021193 |
| CEF-BS | 12 | 25 | 405/65 | 440 | 1YMB531008M0004 | 5901436021209 |
| CEF-BS | 12 | 40 | 405/65 | 440 | 1YMB531008M0005 | 5901436021216 |
| CEF-BS | 12 | 50 | 405/65 | 440 | 1YMB531008M0006 | 5901436021223 |
| CEF-BS | 12 | 63 | 405/65 | 440 | 1 YMB531008M0007 | 5901436021230 |
| CEF-BS | 12 | 80 | 405/87 | 440 | $1 \mathrm{YMB531008M0008}$ | 5901436021247 |
| CEF-BS | 12 | 100 | 405/87 | 440 | 1YMB531008M0009 | 5901436021254 |
| CEF-BS | 12 | 125 | 555/87 | 580 | $1 \mathrm{YMB531008M0010}$ | 5901436021261 |
| CEF-BS | 12 | 160 | 555/87 | 590 | 1YMB531008M0011 | 5901436021278 |
| CEF-BS | 12 | 200 | 555/87 | 590 | 1YMB531008M0012 | 5901436021285 |
| CEF-BS | 17,5 | 6 | 405/65 | 442 | 1YMB531009M0001 | 5901436021506 |
| CEF-BS | 17,5 | 10 | 405/65 | 590 | 1YMB531009M0002 | 5901436021513 |
| CEF-BS | 17,5 | 16 | 405/65 | 590 | $1 \mathrm{YMB531009M0003}$ | 5901436021520 |
| CEF-BS | 17,5 | 25 | 405/65 | 448 | 1YMB531009M0004 | 5901436021537 |
| CEF-BS | 17,5 | 40 | 405/87 | 590 | $1 \mathrm{YMB531009M0005}$ | 5901436021544 |
| CEF-BS | 17,5 | 50 | 405/87 | 590 | 1YMB531009M0006 | 5901436021551 |
| CEF-BS | 17,5 | 63 | 405/87 | 590 | $1 \mathrm{YMB531009M0007}$ | 5901436021568 |
| CEF-BS | 17,5 | 80 | 555/87 | 590 | 1YMB531009M0008 | 5901436021575 |
| CEF-BS | 17,5 | 100 | 555/87 | 590 | 1YMB531009M0009 | 5901436021582 |
| CEF-BS | 17,5 | 125 | 555/87 | 590 | $1 \mathrm{YMB531009M0010}$ | 5901436021599 |
| CEF-BS | 24 | 6 | 555/65 | 590 | 1YMB531010M0001 | 5901436021773 |
| CEF-BS | 24 | 10 | 555/65 | 590 | 1YMB531010M0002 | 5901436021780 |
| CEF-BS | 24 | 16 | 555/65 | 590 | 1YMB531010M0003 | 5901436021797 |
| CEF-BS | 24 | 25 | 555/65 | 590 | 1YMB531010M0004 | 5901436021803 |
| CEF-BS | 24 | 40 | 555/65 | 590 | 1YMB531010M0005 | 5901436021810 |
| CEF-BS | 24 | 50 | 555/87 | 590 | 1YMB531010M0006 | 5901436021827 |
| CEF-BS | 24 | 63 | 555/87 | 590 | 1YMB531010M0007 | 5901436021834 |
| CEF-BS | 24 | 80 | 650/87 | 685 |  |  |
| CEF-BS | 24 | 100 | 650/87 | 685 |  |  |
| CEF-BS | 24 | 125 | 650/87 | 685 |  |  |



Dimension CEF-BS-B




## High voltage current limiting

fuse links type CEF

## 10. DATA AND DIMENSION CEF-BS ACC. TO EN 60282-1:1996

| Type | Rated voltage [kV] | Rated current [A] | L/D [mm] | A/d <br> [mm] | Catalogue No. | EAN13 Codes |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF-BS-B | 3,6/7,2 | 6 | 305/65 | 340/40 | 1YMB531007M0021 | 5901436020844 |
| CEF-BS-B | 3,6/7,2 | 10 | 305/65 | 340/40 | 1YMB531007M0022 | 5901436020851 |
| CEF-BS-B | 3,6/7,2 | 16 | 305/65 | 340/40 | 1YMB531007M0023 | 5901436020868 |
| CEF-BS-B | 3,6/7,2 | 25 | 305/65 | 340/40 | 1YMB531007M0024 | 5901436020875 |
| CEF-BS-B | 3,6/7,2 | 40 | 305/65 | 340/40 | 1YMB531007M0025 | 5901436020882 |
| CEF-BS-B | 3,6/7,2 | 50 | 305/65 | 340/40 | 1YMB531007M0026 | 5901436020899 |
| CEF-BS-B | 3,6/7,2 | 63 | 305/65 | 340/40 | 1YMB531007M0027 | 5901436020905 |
| CEF-BS-B | 3,6/7,2 | 80 | 305/87 | 340/40 | 1YMB531007M0028 | 5901436020912 |
| CEF-BS-B | 3,6/7,2 | 100 | 305/87 | 340/40 | 1YMB531007M0029 | 5901436020929 |
| CEF-BS-D | 3,6/7,2 | 125 | 419/87 | 461/50,5 | 1YMB531007M0030 | 5901436020936 |
| CEF-BS-D | 3,6/7,2 | 160 | 419/87 | 461/50,5 | 1YMB531007M0031 | 5901436020943 |
| CEF-BS-D | 3,6/7,2 | 200 | 419/87 | 461/50,5 | 1YMB531007M0032 | 5901436020950 |
| CEF-BS-D | 12 | 6 | 419/65 | 461/50,5 | 1YMB531008M0021 | 5901436021292 |
| CEF-BS-D | 12 | 10 | 419/65 | 461/50,5 | 1YMB531008M0022 | 5901436021308 |
| CEF-BS-D | 12 | 16 | 419/65 | 461/50,5 | 1YMB531008M0023 | 5901436021315 |
| CEF-BS-D | 12 | 25 | 419/65 | 461/50,5 | 1YMB531008M0024 | 5901436021322 |
| CEF-BS-D | 12 | 40 | 419/65 | 461/50,5 | 1YMB531008M0025 | 5901436021339 |
| CEF-BS-D | 12 | 50 | 419/65 | 461/50,5 | 1YMB531008M0026 | 5901436021346 |
| CEF-BS-D | 12 | 63 | 419/65 | 461/50,5 | 1YMB531008M0027 | 5901436021353 |
| CEF-BS-D | 12 | 80 | 419/87 | 461/50,5 | 1YMB531008M0028 | 5901436021360 |
| CEF-BS-D | 12 | 100 | 419/87 | 461/50,5 | 1YMB531008M0029 | 5901436021377 |
| CEF-BS-B | 12 | 125 | 553/87 | 590/40 | 1YMB531008M0030 | 5901436021384 |
| CEF-BS-B | 12 | 160 | 553/87 | 590/40 | 1YMB531008M0031 | 5901436021391 |
| CEF-BS-B | 12 | 200 | 553/87 | 590/40 | 1YMB531008M0032 | 5901436021407 |
| CEF-BS-D | 17,5 | 6 | 419/65 | 461/50,5 | 1YMB531009M0021 | 5901436021605 |
| CEF-BS-D | 17,5 | 10 | 419/65 | 461/50,5 | 1YMB531009M0022 | 5901436021612 |
| CEF-BS-D | 17,5 | 16 | 419/65 | 461/50,5 | 1YMB531009M0023 | 5901436021629 |
| CEF-BS-D | 17,5 | 25 | 419/65 | 461/50,5 | 1YMB531009M0024 | 5901436021636 |
| CEF-BS-D | 17,5 | 40 | 419/87 | 461/50,5 | 1YMB531009M0025 | 5901436021643 |
| CEF-BS-D | 17,5 | 50 | 419/87 | 461/50,5 | 1YMB531009M0026 | 5901436021650 |
| CEF-BS-D | 17,5 | 63 | 419/87 | 461/50,5 | 1YMB531009M0027 | 5901436021667 |
| CEF-BS-B | 17,5 | 80 | 553/87 | 590/40 | 1YMB531009M0028 | 5901436021674 |
| CEF-BS-B | 17,5 | 100 | 553/87 | 590/40 | 1YMB531009M0029 | 5901436021681 |
| CEF-BS-B | 17,5 | 125 | 553/87 | 590/40 | 1YMB531009M0030 | 5901436021698 |
| CEF-BS-B | 24 | 6 | 553/65 | 590/40 | 1YMB531010M0021 | 5901436021841 |
| CEF-BS-B | 24 | 10 | 553/65 | 590/40 | 1YMB531010M0022 | 5901436021858 |
| CEF-BS-B | 24 | 16 | 553/65 | 590/40 | 1YMB531010M0023 | 5901436021865 |
| CEF-BS-B | 24 | 25 | 553/65 | 590/40 | 1YMB531010M0024 | 5901436021872 |
| CEF-BS-B | 24 | 40 | 553/65 | 590/40 | 1YMB531010M0025 | 5901436021889 |
| CEF-BS-B | 24 | 50 | 553/87 | 590/40 | 1YMB531010M0026 | 5901436021896 |
| CEF-BS-B | 24 | 63 | 553/87 | 590/40 | 1YMB531010M0027 | 5901436021902 |
| CEF-BS-C | 3,6/7,2 | 6 | 305/65 | 340/40 | 1YMB531007M0041 | 5901436020967 |
| CEF-BS-C | 3,6/7,2 | 10 | 305/65 | 340/40 | 1YMB531007M0042 | 5901436020974 |
| CEF-BS-C | 3,6/7,2 | 16 | 305/65 | 340/40 | 1YMB531007M0043 | 5901436020981 |
| CEF-BS-C | 3,6/7,2 | 25 | 305/65 | 340/40 | 1YMB531007M0044 | 5901436020998 |
| CEF-BS-C | 3,6/7,2 | 40 | 305/65 | 340/40 | 1YMB531007M0045 | 5901436021001 |
| CEF-BS-C | 3,6/7,2 | 50 | 305/65 | 340/40 | 1YMB531007M0046 | 5901436021018 |
| CEF-BS-C | 3,6/7,2 | 63 | 305/65 | 340/40 | 1YMB531007M0047 | 5901436021025 |
| CEF-BS-C | 3,6/7,2 | 80 | 305/87 | 340/40 | 1YMB531007M0048 | 5901436021032 |
| CEF-BS-C | 3,6/7,2 | 100 | 305/87 | 340/40 | 1YMB531007M0049 | 5901436021049 |
| CEF-BS-C | 3,6/7,2 | 6 | 320/65 | 361/50,5 | 1YMB531007M0061 | 5901436021087 |
| CEF-BS-C | 3,6/7,2 | 10 | 320/65 | 361/50,5 | 1YMB531007M0062 | 5901436021094 |
| CEF-BS-C | 3,6/7,2 | 16 | 320/65 | 361/50,5 | 1YMB531007M0063 | 5901436021100 |
| CEF-BS-C | 3,6/7,2 | 25 | 320/65 | 361/50,5 | 1YMB531007M0064 | 5901436021117 |
| CEF-BS-C | 3,6/7,2 | 40 | 320/65 | 361/50,5 | 1YMB531007M0065 | 5901436021124 |
| CEF-BS-C | 3,6/7,2 | 50 | 320/65 | 361/50,5 | 1YMB531007M0066 | 5901436021131 |
| CEF-BS-C | 3,6/7,2 | 63 | 320/65 | 361/50,5 | 1YMB531007M0067 | 5901436021148 |
| CEF-BS-C | 3,6/7,2 | 80 | 320/87 | 361/50,5 | 1YMB531007M0068 | 5901436021155 |
| CEF-BS-C | 3,6/7,2 | 100 | 320/87 | 361/50,5 | 1YMB531007M0069 | 5901436021162 |
| CEF-BS-C | 3,6/7,2 | 125 | 400/87 | 440/40 | 1YMB531007M0050 | 5901436021056 |
| CEF-BS-C | 3,6/7,2 | 160 | 400/87 | 440/40 | 1YMB531007M0051 | 5901436021063 |
| CEF-BS-C | 3,6/7,2 | 200 | 400/87 | 440/40 | 1YMB531007M0052 | 5901436021070 |
| CEF-BS-C | 12 | 6 | 400/65 | 440/40 | 1YMB531008M0041 | 5901436021414 |
| CEF-BS-C | 12 | 10 | 400/65 | 440/40 | 1YMB531008M0042 | 5901436021421 |
| CEF-BS-C | 12 | 16 | 400/65 | 440/40 | 1YMB531008M0043 | 5901436021438 |
| CEF-BS-C | 12 | 25 | 400/65 | 440/40 | 1YMB531008M0044 | 5901436021445 |
| CEF-BS-C | 12 | 40 | 400/65 | 440/40 | 1YMB531008M0045 | 5901436021452 |
| CEF-BS-C | 12 | 50 | 400/65 | 440/40 | 1YMB531008M0046 | 5901436021469 |
| CEF-BS-C | 12 | 63 | 400/65 | 440/40 | 1YMB531008M0047 | 5901436021476 |
| CEF-BS-C | 12 | 80 | 400/87 | 440/40 | 1YMB531008M0048 | 5901436021483 |
| CEF-BS-C | 12 | 100 | 400/87 | 440/40 | 1YMB531008M0049 | 5901436021490 |
| CEF-BS-C | 17,5 | 6 | 400/65 | 440/40 | 1YMB531009M0041 | 5901436021704 |
| CEF-BS-C | 17,5 | 10 | 400/65 | 440/40 | 1YMB531009M0042 | 5901436021711 |
| CEF-BS-C | 17,5 | 16 | 400/65 | 440/40 | 1YMB531009M0043 | 5901436021728 |
| CEF-BS-C | 17,5 | 25 | 400/65 | 440/40 | 1YMB531009M0044 | 5901436021735 |
| CEF-BS-C | 17,5 | 40 | 400/87 | 440/40 | 1YMB531009M0045 | 5901436021742 |
| CEF-BS-C | 17,5 | 50 | 400/87 | 440/40 | 1YMB531009M0046 | 5901436021759 |
| CEF-BS-C | 17,5 | 63 | 400/87 | 440/40 | 1YMB531009M0047 | 5901436021766 |

## High voltage current limiting

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## High voltage current limiting

## fuse links type CEF-S

## 1. GENERALLY

As appears from the chart HighVoltage Current Limiting fuse links type CEF-S have a minimum current value $\left(\mathrm{I}_{0,1 \text { sed }}\right)$ which makes the fuse link interrupt the fault current within 100 ms . This ensures very good protection and prevents faults in low voltage switchgears. The current value for the different fuse link types is shown for the total maximum breaking time of 100 ms . For bigger fault currents the maximum total breaking time will be shorter. CEF-S fuses are specially designed to achieve as low as possible value for the breaking current at 100 ms . However, this results in the reduction of the margin, which for standard CEF fuses prevents fuse link operation due to inrush currents developed when an unloaded power transformer is energised. At the given $\mathrm{I}_{0.1 \text { sec }}$ values the total breaking time is maximum 100 ms - this value includes maximum pre-arcing time, arcing time and production tolerance.

## 2. DIMENSIONS AND ELECTRICAL DATA

| $\mathrm{U}_{\mathrm{n}}$ | $\mathrm{I}_{\mathrm{n}}$ | e | D | $I_{1}$ | $\mathrm{I}_{3}$ | $\mathrm{I}_{0.1 \text { tsek }}$ | Pn | v | Ro |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| [kV] | [A] | [mm] | [mm] | [kA] | [A] | [A] | [Watt] | [kg] | [m $\Omega$ ] |
| 12 | 10 | 292 | 65 | 50 | 55 | 48 | 27 | 2,3 | 187,0 |
|  | 16 | 292 | 65 | 50 | 55 | 80 | 38 | 2,3 | 108,5 |
|  | 20 | 292 | 65 | 50 | 72 | 120 | 39 | 2,3 | 72,3 |
|  | 25 | 292 | 65 | 50 | 72 | 160 | 45 | 2,3 | 46,5 |
|  | 40 | 292 | 65 | 50 | 100 | 240 | 54 | 2,3 | 24,5 |
|  | 50 | 292 | 65 | 50 | 190 | 330 | 70 | 2,3 | 18,8 |
| 24 | 10 | 442 | 65 | 25 | 55 | 48 | 54 | 3 | 373,2 |
|  | 16 | 442 | 65 | 25 | 55 | 80 | 67 | 3 | 186,6 |
|  | 20 | 442 | 65 | 25 | 72 | 120 | 69 | 3 | 124,4 |
|  | 25 | 442 | 65 | 25 | 72 | 160 | 70 | 3 | 93,3 |
|  | 40 | 442 | 65 | 25 | 110 | 240 | 122 | 3 | 48,8 |

## Symbols

e = see figure
D = see figure
$\mathrm{I}_{1}=$ maximum rated breaking current
$I_{0,1 \text { sek }}=$ lowest current which gives maximum breaking
time smaller than or equal to 100 ms
$P_{n}=$ power losses at rated current
$\mathrm{V}=$ weight
$R_{o}=$ resistance at room temperature

## High voltage current limiting

## 3. TIME-CURRENT CHARACTERISTICS



## Melting times

The characteristic curves are the same for rated voltage 12 and 24 kV taken from cold condition.


## High voltage current limiting

## fuse links type CEF-S

## 4. SELECTION TABLE FOR TRANSFORMER PROTECTION DIMENSION AND CHARACTERISTIC

| Rated Voltage | $\mathbf{5 0}$ | $\mathbf{1 0 0}$ | $\mathbf{2 0 0}$ | $\mathbf{3 1 5}$ | $\mathbf{5 0 0}$ | 630 | $\mathbf{8 0 0}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 10.5 kV | 10 | 16 | 25 | 25 | 40 | 40 | 50 |
| 12 kV | 10 | 16 | 25 | 25 | 40 | 40 | 50 |
| 21 kV | 10 | 10 | 16 | 16 | 20 | 20 | 25 |
| 24 kV | 10 | 10 | 16 | 16 | 20 | 20 | 25 |

Fuse link selected according to the selection table meet the following requirements:

- Rated current of the fuse link $>1,1 \times I_{n}$ of the transformers rated current $\left(I_{n}\right)$
-The maximum breaking time is 100 ms or less for currents bigger than or equal to $I_{0,1 \mathrm{sec}}$.

| Transformer Rating | Voltage | Fuse Link rating | $\mathbf{I}_{0,1 \text { sec }}$ |
| :---: | :---: | :---: | :---: |
| $[\mathbf{k V A}]$ | $[\mathbf{k V}]$ | $[\mathbf{A}]$ | $[\mathbf{A}]$ |
| 315 | 12 | 25 | 160 |
| 500 | 12 | 40 | 240 |
| 630 | 12 | 40 | 240 |
| 800 | 12 | 50 | 330 |
| 315 | 24 | 16 | 80 |
| 500 | 24 | 20 | 120 |
| 630 | 24 | 20 | 120 |
| 800 | 24 | 25 | 160 |

For different power transformer sizes and rated voltages, power losses are as shown in the table below. The measurements were done at the rated power and air cooling according to IEC 282-1. The losses are mentioned per single fuse. If the fuse link shall be used in compact switchgears, where cooling is limited, the supplier shall be contacted regarding maximum permitted power losses and required fuse link derating.

| Transformer size | Rated Voltage |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| [kVA] | [kV] |  |  |  |
|  | Power loss per single fuse link at the transformer's rated current [W] |  |  |  |
|  | 24 |  |  |  |
|  | 2 | 2 | 12 | 1 |
|  | 5 | 4 | 4 | 3 |
|  | 9 | 7 | 8 | 6 |
|  | 22 | 17 | 20 | 15 |
|  | 26 | 20 | 31 | 24 |
| 800 | 42 | 32 | 49 | 38 |

## 5. ORDERING TABLE

| Type | Rated voltage | Rated current | e/D | Catalouge No | EAN13 Codes | Weight |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $[\mathbf{k V}]$ | $[\mathbf{A}]$ | $[\mathbf{m m}]$ |  |  | [kg] |
| CEF-S | 12 | 10 | $292 / 65$ | 1YMB531011M0001 | 5901436021919 | 2,3 |
| CEF-S | 12 | 16 | $292 / 65$ | 1YMB531011M0002 | 5901436021926 | 2,3 |
| CEF-S | 12 | 20 | $292 / 65$ | 1YMB531011M0003 | 5901436021933 | 2,3 |
| CEF-S | 12 | 25 | $292 / 65$ | 1YMB531011M0004 | 5901436021940 | 2,3 |
| CEF-S | 12 | 40 | $292 / 65$ | 1YMB531011M0005 | 5901436021957 | 2,3 |
| CEF-S | 12 | 50 | $292 / 65$ | 1YMB531011M0006 | 5901436021964 | 2,3 |
| CEF-S | 24 | 10 | $442 / 65$ | 1YMB531012M0001 | 5901436021988 | 3 |
| CEF-S | 24 | 16 | $442 / 65$ | 1YMB531012M0002 | 5901436021995 | 3 |
| CEF-S | 24 | 20 | $442 / 65$ | 1YMB531012M0003 | 5901436022008 | 3 |
| CEF-S | 24 | 25 | $442 / 65$ | 1YMB531012M0004 | 5901436022015 | 3 |
| CEF-S | 24 | 40 | $442 / 65$ | 1YMB531012M0005 | 5901436022022 | 3 |

## Voltage Transformer Fuses

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## Voltage Transformer Fuses

## fuse links type CEF-VT

## Rated voltage: 7,2/24 kV Rated current: 2-6,3 A

## 1. GENERAL

The new generation of fuse link type CEF-VT are designed and tested according to IEC 60282-1:2002.
Dimensionally the fuse links are in accordance with DIN 43625. CEF-VT fuses are applicable as voltage transformer fuses and as typical protection requesting current limiting back-up fuses.
ABB's high voltage fuse links have the following properties:

- Low minimum breaking current
- Low power losses
- Low arc-voltage
- High breaking capacity
- High current limitation.

CEF-VT fuses are of back-up type. They have a zone between the minimum melting current and the minimum breaking current where the fuse links may fail to interrupt.
For CEF-VT fuse links this zone is very narrow. The minimum breaking current $\mathrm{I}_{3}$ for any type is specified in the table on p .25.

## 2. OVERVOLTAGES

In order to be current limiting, the fuse link must generate an arc-voltage exceeding the instantaneous value of the operating voltage. The switching voltage generated by the CEF-VT fuse link is below the maximum permissible value acc. to IEC 60282-1:2002. The CEF-VT fuse link can safely be used the system line voltage of $7,2 / 12$ and $17 / 24 \mathrm{kV}$.

## 3. CHOICE OF FUSE LINKS

## Selection of voltage transformer fuses

ABB recommends using voltage transformer fuses type WBP and CEF-VT in supplying circuits of medium voltage single/double insulated poles voltage transformers. Voltage transformer fuses provide:

1) Electrical shock protection in case of main insulation damage of voltage transformer and high voltage penetration into low voltage side of voltage transformer.
2) Protection of switchgear apparatus from internal short circuits results of voltage transformers.

Main selection rules of voltage transformer fuses are similar to current limiting fuses (type CEF) for protection of distribution transformers

## Choice of rated voltage

- The rated current of the fuse links should be equal to, or higher than the maximum operating system voltage of installation place


## Choice of rated current

- The rated voltage of fuse links should be higher than maximum continuous current of voltage transformer (depends on voltage transformer load level).


## Moreover we should observe:

a) Starting conditions

- Initial starting current of voltage transformer should not cause fuse tripping in normal working condition.
b) Short circuit conditions
- Rated breaking current of fuse links should be higher than prospective value of short circuit in installation place.
c) Overvoltages
- Impulse insulation withstand of electrical system (switchgear) should be higher than switching overvoltages generated by fuse links.

Voltage transformer fuses do not protect voltage transformer against overloading results.

## Voltage Transformer Fuses

## 4. ORDERING TABLE

High-voltage - HRC fuse links

| Type | Rated voltage Un [kV] | Rated current [A] | Length e [mm] | Diameter <br> D [mm] | Catalogue No. | EAN13 Codes | Weight [kg] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF-VT | 7,2/12 | 2 | 192 | 53 | 1YMB531048M0001 | 5901436024378 | 1,50 |
| CEF-VT | 7,2/12 | 2 | 292 | 53 | 1YMB531049M0001 | 5901436024408 | 1,60 |
| CEF-VT | 7,2/12 | 2 | 192 | 53 | 1YMB531048M0002 | 5901436024385 | 1,50 |
| CEF-VT | 7,2/12 | 2 | 292 | 53 | 1YMB531049M0002 | 5901436024415 | 1,60 |
| CEF-VT | 7,2/12 | 6,3 | 192 | 53 | 1YMB531048M0003 | 5901436024392 | 1,30 |
| CEF-VT | 7,2/12 | 6,3 | 292 | 53 | 1YMB531049M0003 | 5901436024422 | 1,90 |
| CEF-VT | 17,5/24 | 2 | 292 | 53 | 1YMB531050M0001 | 5901436024439 | 1,60 |
| CEF-VT | 17,5/24 | 2 | 442 | 53 | 1YMB531046M0001 | 5901436024316 | 2,40 |
| CEF-VT | 17,5/24 | 6,3 | 292 | 53 | 1YMB531050M0003 | 5901436024446 | 1,90 |
| CEF-VT | 17,5/24 | 6,3 | 442 | 53 | 1YMB531046M0003 | 5901436024323 | 2,50 |

## 5. DATA AND DIMENSIONS CEF-VT

| Type | Striker | Rated voltage $\mathrm{U}_{\mathrm{n}}[\mathrm{kV}]$ | Rated current $\mathrm{I}_{\mathrm{n}}[\mathrm{kV}]$ | Length e [mm] | Diameter <br> D [mm] | Short circuit current $I_{1}$ [kA] | Minimum breaking current $\mathrm{I}_{3}[\mathrm{~A}]$ | Rated power losses $\mathrm{P}_{\mathrm{n}}$ [W] | Resistance $R_{0}[\mathrm{~m} \Omega]$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CEF-VT | no | 7,2/12 | 2 | 192 | 53 | 63 | 27 | 7,4 | 1,50 |
| CEF-VT | no | 7,2/12 | 2 | 292 | 53 | 63 | 27 | 7,4 | 1,50 |
| CEF-VT | yes | 7,2/12 | 2 | 192 | 53 | 63 | 27 | 7,4 | 1,34 |
| CEF-VT | yes | 7,2/12 | 2 | 292 | 53 | 63 | 27 | 7,4 | 1,34 |
| CEF-VT | yes | 7,2/12 | 6,3 | 192 | 53 | 63 | 41 | 18 | 0,33 |
| CEF-VT | yes | 7,2/12 | 6,3 | 292 | 53 | 63 | 41 | 18 | 0,33 |
| CEF-VT | no | 17,5/24 | 2 | 292 | 53 | 31,5 | 32 | 17 | 3,10 |
| CEF-VT | no | 17,5/24 | 2 | 442 | 53 | 31,5 | 32 | 17 | 3,10 |
| CEF-VT | yes | 17,5/24 | 6,3 | 292 | 53 | 31,5 | 46 | 35 | 0,60 |
| CEF-VT | yes | 17,5/24 | 6,3 | 442 | 53 | 31,5 | 46 | 35 | 0,60 |



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## High voltage current limiting

## fuse links for MOTOR circuit applications type CMF

## 1. GENERAL

The fuse links type CMF are specially designed for motor circuit applications. They are tested according to the IEC Publication 60282-1 (IEC 282-1) and Publication 644. The IEC 644 applies to fuse links used with motors started direct-on-line on alternating current systems. High voltage fuses used in motor circuits must have the ability to withstand, without deterioration, the repeated surges associated with motor starting.
The dimensions are in accordance with DIN 43625, i.e. the 3,6 kV rating is realized in the normal 12 kV length $(e=292 \mathrm{~mm})$. The $7,2 \mathrm{kV}$ and 12 kV rating in the 24 kV length $(\mathrm{e}=442 \mathrm{~mm})$.
Special connection elements can be delivered in cases where fuses have to be paralleled.
ABB's motor fuses have the following properties:

- higher current rating within single body dimensions
- tested according to IEC 644 which guaranties excellent ability to withstand repeated motor starting conditions
- low power losses
- low minimum breaking current
- high breaking capacity and excellent short circuit current limitation.

Although a motor fuse is normally run at a stationary current which is much lower than the fuse rated current, the low-loss characteristics of the CMF fuses make them especially suitable in compact contactor compartments.

## 2. ORDERING TABLE TYPE CMF

High voltage - fuse links

| Type | Rated <br> voltage <br> $[\mathbf{k V}]$ | Rated <br> Current <br> $[\mathbf{A}]$ | $\mathbf{e}$ <br> $[\mathbf{m m}]$ | $\mathbf{D}$ <br> $[\mathbf{m m}]$ | Catalogue No. | EAN13 Codes | Weight <br> [kg] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CMF | 3,6 | 100 | 292 | 65 | 1YMB531028M0001 | 5901436023197 | 2,3 |
| CMF | 3,6 | 160 | 292 | 65 | 1YMB531028M0002 | 5901436023203 | 2,3 |
| CMF | 3,6 | 200 | 292 | 87 | 1YMB531028M0003 | 5901436023210 | 2,6 |
| CMF | 3,6 | 250 | 292 | 87 | 1YMB531028M0004 | 5901436023227 | 3,8 |
| CMF | 3,6 | 315 | 292 | 87 | 1YMB531028M0005 | 5901436023234 | 3,8 |
| CMF | 7,2 | 63 | 442 | 65 | 1YMB531029M0001 | 5901436023241 | 3,0 |
| CMF | 7,2 | 100 | 442 | 65 | 1YMB531029M0002 | 5901436023258 | 3,0 |
| CMF | 7,2 | 160 | 442 | 65 | 1YMB531029M0003 | 5901436023265 | 3,0 |
| CMF | 7,2 | 200 | 442 | 87 | 1YMB531029M0004 | 5901436023272 | 5,3 |
| CMF | 7,2 | 250 | 442 | 87 | 1YMB531029M0005 | 5901436023289 | 5,3 |
| CMF | 7,2 | 315 | 442 | 87 | 1YMB531029M0006 | 5901436023296 | 5,3 |
| CMF | 12 | 63 | 442 | 65 | 1YMB531030M0001 | 5901436023302 | 3,0 |
| CMF | 12 | 100 | 442 | 87 | 1YMB531030M0002 | 5901436023319 | 5,3 |
| CMF | 12 | 160 | 442 | 87 | 1YMB531030M0003 | 5901436023326 | 5,3 |
| CMF | 12 | 200 | 442 | 87 | 1YMB531030M0004 | 5901436023333 | 5,3 |

## 3. ORDERING TABLE UCM

| Type | Rated voltage [kV] | Dimensions in mm |  |  |  |  |  |  | Weight [kg] | Catalogue No. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | A | $\mathrm{A}_{1}$ | $\mathrm{A}_{2}$ | H | K | $\mathrm{K}_{1}$ | B |  |  |
| UCM | 3,6 | 232 | 160 | 220 | 410 | 318 | 293 | 180 | 3,7 | 1YMX139037R001 |
| UCM | 7,2/12 | 232 | 160 | 220 | 570 | 468 | 443 | 300 | 4,2 | 1YMX139037R002 |

## High voltage current limiting

fuse links for MOTOR circuit applications type CMF


## 4. ORDERING TABLE TYPE CMF-BS

| Type | Rated voltage [kV] | Rated Current [A] | $\begin{gathered} \mathrm{L} / \mathrm{D} \\ {[\mathrm{~mm}]} \end{gathered}$ | A/d [mm] | Catalogue No. | EAN13 Codes | Weight [kg] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CMF-BS-C | 3,6 | 100 | 400/65 | 440/40 | 1YMB531031M0021 | 5901436023449 | 2,6 |
| CMF-BS-C | 3,6 | 160 | 400/65 | 440/40 | 1YMB531031M0022 | 5901436023456 | 2,6 |
| CMF-BS-C | 3,6 | 200 | 400/87 | 440/40 | 1YMB531031M0023 | 5901436023463 | 3,9 |
| CMF-BS-C | 3,6 | 250 | 400/87 | 440/40 | 1YMB531031M0024 | 5901436023470 | 4,1 |
| CMF-BS-C | 3,6 | 315 | 400/87 | 440/40 | 1YMB531031M0025 | 5901436023487 | 4,1 |
| CMF-BS-D | 3,6 | 100 | 419/65 | 461/50,5 | 1YMB531031M0011 | 5901436023395 | 2,6 |
| CMF-BS-D | 3,6 | 160 | 419/65 | 461/50,5 | 1YMB531031M0012 | 5901436023401 | 2,6 |
| CMF-BS-D | 3,6 | 200 | 419/87 | 461/50,5 | 1YMB531031M0013 | 5901436023418 | 4,1 |
| CMF-BS-D | 3,6 | 250 | 419/87 | 461/50,5 | 1YMB531031M0014 | 5901436023425 | 4,1 |
| CMF-BS-D | 3,6 | 315 | 419/87 | 461/50,5 | 1YMB531031M0015 | 5901436023432 | 4,1 |
| CMF-BS-B | 7,2 | 63 | 553/65 | 590/40 | 1YMB531032M0021 | 5901436023555 | 3,3 |
| CMF-BS-B | 7,2 | 100 | 553/65 | 590/40 | 1YMB531032M0022 | 5901436023562 | 3,3 |
| CMF-BS-B | 7,2 | 160 | 553/65 | 590/40 | 1YMB531032M0023 | 5901436023579 | 3,3 |
| CMF-BS-B | 7,2 | 200 | 553/87 | 590/40 | 1YMB531032M0024 | 5901436023586 | 5,6 |
| CMF-BS-B | 7,2 | 250 | 553/87 | 590/40 | 1YMB531032M0025 | 5901436023593 | 5,6 |
| CMF-BS-B | 7,2 | 315 | 553/87 | 590/40 | 1YMB531032M0026 | 5901436023609 | 5,6 |
| CMF-BS-B | 12 | 63 | 553/65 | 590/40 | 1YMB531033M0021 | 5901436023654 | 3,3 |
| CMF-BS-B | 12 | 100 | 553/87 | 590/40 | 1YMB531033M0022 | 5901436023661 | 5,6 |
| CMF-BS-B | 12 | 160 | 553/87 | 590/40 | 1YMB531033M0023 | 5901436023678 | 5,6 |
| CMF-BS-B | 12 | 200 | 553/87 | 590/40 | 1YMB531033M0024 | 5901436023685 | 5,6 |
| CMF-BS | 3,6 | 100 | 405/65 | 440/40 | 1YMB531031M0001 | 5901436023340 | 2,6 |
| CMF-BS | 3,6 | 160 | 405/65 | 440/40 | 1YMB531031M0002 | 5901436023357 | 2,6 |
| CMF-BS | 3,6 | 200 | 405/87 | 440/40 | 1YMB531031M0003 | 5901436023364 | 4,1 |
| CMF-BS | 3,6 | 250 | 405/87 | 440/40 | 1YMB531031M0004 | 5901436023371 | 4,1 |
| CMF-BS | 3,6 | 315 | 405/87 | 440/40 | 1YMB531031M0005 | 5901436023388 | 4,1 |
| CMF-BS | 7,2 | 63 | 555/65 | 590/40 | 1YMB531032M0001 | 5901436023494 | 3,3 |
| CMF-BS | 7,2 | 100 | 555/65 | 590/40 | 1YMB531032M0002 | 5901436023500 | 3,3 |
| CMF-BS | 7,2 | 160 | 555/65 | 590/40 | 1YMB531032M0003 | 5901436023517 | 3,3 |
| CMF-BS | 7,2 | 200 | 555/87 | 590/40 | 1YMB531032M0004 | 5901436023524 | 5,6 |
| CMF-BS | 7,2 | 250 | 555/87 | 590/40 | 1YMB531032M0005 | 5901436023531 | 5,6 |
| CMF-BS | 7,2 | 315 | 555/87 | 590/40 | 1YMB531032M0006 | 5901436023548 | 5,6 |
| CMF-BS | 12 | 63 | 555/65 | 590/40 | 1YMB531033M0001 | 5901436023616 | 3,3 |
| CMF-BS | 12 | 100 | 555/87 | 590/40 | 1YMB531033M0002 | 5901436023623 | 5,6 |
| CMF-BS | 12 | 160 | 555/87 | 590/40 | 1YMB531033M0003 | 5901436023630 | 5,6 |
| CMF-BS | 12 | 200 | 555/87 | 590/40 | 1YMB531033M0004 | 5901436023647 | 5,6 |

## High voltage current limiting

## fuse links for MOTOR circuit applications type CMF



## 5. PRE-ARCING TIMES

The characteristics are equal or all rated voltages and are recorded from cold condition.

6. CURRENT LIMITATION


## High voltage current limiting

## fuse links for MOTOR circuit applications type CMF

## 7. CHOICE OF FUSE LINKS

Choice of rated current $I_{N}$
The minimum permissible current rating of the fuse link for motor protection may be determined from the selection charts I, II and III. The three different charts are for run-up times of 6,15 and 60 seconds respectively.
Each chart contains different characteristics, depending on the number of starts per hour. Of this specific number of starts per hour, the first two are in immediate succession, the rest being evenly spaced in the 1 hour period. The number of starts per hour indicates the time interval between separate starts. For example, 4 starts in 15 minutes are represented by 16 starts per hour. On the horizontal axis of the selection chart, the motor starting current is given, and along the vertical axis the current rating of the fuse link is found.

## Selection procedure:

- Select the charts which are appropriate for the run-up time of the motor,
- select the starting current along the horizontal axis,
- depending on the number of starts per hour, select the correct characteristic ( $2,4,8,16,32$ ),
- read of the correct rating of the fuse link onthe vertical axis.

The main function of motor fuses is protection against short circuits only. That is why fuses are selected to withstand start up currents only. Minimum breaking current has very limited importance for such a application.

| Example: | A | B |
| :--- | :---: | :---: |
| Starting current of the motor | 850 A | 250 A |
| Run-up time | 6 sec. | 15 sec. |
| Number of starts per hour | 2 | 16 |
| Chart number | 1 | 2 |
| Rated current of fuse link | 250 A | 160 A |




## 8. THE K-FACTOR

According to the IEC 60644, the K-factor is a factor (less than unity) defining an overload characteristic to which the fuse link may be repeatedly subjected under specified motor starting conditions without deterioration. The overload characteristic is obtained by multiplying the current on the prearcing characteristic (melting time characteristics) by K. The Value of K given in the data table is chosen at 10 seconds melting time, and is valid for melting times between 5 and 60 seconds.

## 9. DATA AND DIMENSIONS CMF

| $U_{N}$ | $\mathrm{I}_{\mathrm{N}}$ | e | D | K* | $I_{1}$ | $I_{3}$ | R | $\mathrm{P}_{\mathrm{N}}$ | $\underset{I^{2} x t}{\text { Minimum }}$ | $\underset{I^{2} x t}{\text { Maximum }}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| [kV] | [A] | [mm] | [mm] | - | [kA] | [A] | [m $\Omega$ ] | [W] | Pre-arc $\mathrm{A}^{2} \mathrm{~s}$ | Interruption $A^{2} s$ |
| 3,6 | 100 | 292 | 65 | 0,75 | 50 | 275 | 3,20 | 49 | $1,4 \times 10^{4}$ | $17 \times 10^{4}$ |
|  | 160 | 292 | 65 | 0,7 | 50 | 400 | 1,92 | 75 | $3,8 \times 10^{4}$ | $50 \times 10^{4}$ |
|  | 200 | 292 | 87 | 0,7 | 50 | 500 | 1,40 | 75 | $7,6 \times 10^{4}$ | $71 \times 10^{4}$ |
|  | 250 | 292 | 87 | 0,6 | 50 | 760 | 0,97 | 90 | $14 \times 10^{4}$ | $115 \times 10^{4}$ |
|  | 315 | 292 | 87 | 0,6 | 50 | 900 | 0,81 | 122 | $21 \times 10^{4}$ | $180 \times 10^{4}$ |
| 7,2 | 63 | 442 | 65 | 0,75 | 50 | 175 | 8,50 | 45 | $0,48 \times 10^{4}$ | $6,5 \times 10^{4}$ |
|  | 100 | 442 | 65 | 0,75 | 50 | 275 | 4,86 | 67 | $1,40 \times 10^{4}$ | $18 \times 10^{4}$ |
|  | 160 | 442 | 65 | 0,7 | 50 | 400 | 2,92 | 119 | $3,8 \times 10_{4}$ | $54 \times 10^{4}$ |
|  | 200 | 442 | 87 | 0,7 | 50 | 500 | 2,12 | 118 | $7,6 \times 10^{4}$ | $75 \times 10^{4}$ |
|  | 250 | 442 | 87 | 0,6 | 50 | 800 | 1,48 | 142 | $14 \times 10^{4}$ | $120 \times 10^{4}$ |
|  | 315 | 442 | 87 | 0,6 | 50 | 950 | 1,23 | 193 | $21 \times 10^{4}$ | $220 \times 10^{4}$ |
| 12 | 63 | 442 | 65 | 0,75 | 50 | 190 | 13,52 | 77 | $0,48 \times 10^{4}$ | $11 \times 10^{4}$ |
|  | 100 | 442 | 87 | 0,75 | 50 | 275 | 6,62 | 103 | $1,4 \times 10^{4}$ | $20 \times 10^{4}$ |
|  | 160 | 442 | 87 | 0,7 | 50 | 480 | 3,98 | 155 | $3,8 \times 10^{4}$ | $70 \times 10^{4}$ |
|  | 200 | 442 | 87 | 0,7 | 50 | 560 | 2,73 | 173 | $9,3 \times 10^{4}$ | $91 \times 10^{4}$ |



## Legends:

## e = see figure

D = see figure
K = K-factor acc. to IEC 60644
$\mathrm{I}_{1}=$ max. short circuit current tested
$I_{3}=$ minimum breaking current
$\mathrm{R}_{0}=$ resistance at room temperature
$P_{N}=$ power loss at rated current

[^0]
## Voltage Transformer Fuses

Indoor - WBP Outdoor - BRT

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## Voltage Transformer Fuses

## Indoor - WBP Outdoor - BRT

## 1. FEATURES

- Unlimited breaking capacity
- Short-circuit current limiting
- Small dimensions.


## 2. APPLICATIONS

The WBP fuse-links are used to protect switchgear equipment against short-circuits in voltage transformers. Protection of switchgear equipment is very effective thanks to unlimited breaking capacity and short circuit current limitation. Thanks to very small dimensions WBP type fuse-links can be used in various types of switchgears, including flame-proof types.

## 3. ENVIRONMENTAL OPERATING CONDITIONS

The Type WBP... and BRT... Fuse-links can be operated under the following environmental conditions:

## Table 1.

| Temperature | Type of fuse-links |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | WBP |  | BRT |  |
|  | N3 | T3 | N1 | T1 |
|  | $\begin{aligned} & \text { From }-5^{\circ} \mathrm{C} \\ & \text { to }+40^{\circ} \mathrm{C} \end{aligned}$ | From $-5^{\circ} \mathrm{C}$ to $+50^{\circ} \mathrm{C}$ | $\begin{gathered} \text { From }-25^{\circ} \mathrm{C} \\ \text { to }+40^{\circ} \mathrm{C} \end{gathered}$ | $\begin{aligned} & \text { From }-10^{\circ} \mathrm{C} \\ & \text { to }+50^{\circ} \mathrm{C} \end{aligned}$ |
| Relative humidity of ambient air at a temperature: $\begin{aligned} & \mathrm{N}-+20^{\circ} \mathrm{C} \\ & \mathrm{~T}-+30^{\circ} \mathrm{C} \end{aligned}$ | to 80\% | to 95\% | to $100 \%$ | to $100 \%$ |
| Height of installation above the see level | Up to 1000 m |  |  |  |

Designations:
N - Normal climate 1 - Outdoor installation
T-Tropical wet and dry climate 3 - Indoor installation

## 4. DESIGNATIONS AND VERSIONS

### 4.1 WBP indoor instrument transformer fuse-links numbering system

The numbering system for the WBP fuse-links has two alphanumerical sections as shown in the following diagram.

| WBP | 6 |
| :---: | :---: |
| Indoor | Rated Voltage |
| Fuse-link | 6-7,2 kV |
| type | 10-12 kV |
|  | 20-24 kV |
|  | 30-36 kV |

4.2 BRT outdoor instrument transforme fuse-links numbering system.

The numbering system for the BRT fuse-links has two alphanumerical sections as shown in the following diagram.

| BRT | 6 |
| :---: | :---: |
| Outdoor | Rated Voltage |
| Fuse-link | $6-7,2$ and 12 kV |
| type | $15-17,5 \text { and } 24 \mathrm{kV}$ |

### 4.3 Indoor fuse-bases numbering system

The numbering system for indoor fuse-bases has two alphanumerical sections as shown in the following diagram.

| PBPM | 6 |
| :---: | :---: |
| Fuse-base type | Rated Voltage $6-7,2 \mathrm{kV}$ |
|  | 10-12 kV |
|  | 20-24 kV |
|  | 30-36 kV |

## Voltage Transformer Fuses

### 4.4 Outdoor fuse-bases numbering system

The numbering system for outdoor fuse-bases have four double alphanumerical sections as shown in the following diagram. A fuse-link when mounted on a fuse-base makes a complete fuse. For the available fuse-bases refer to Table 2.

| PBPM |  | I | 36 | W.II-1 |
| :---: | :---: | :---: | :---: | :---: |
| Fuse-base type |  | Kind of fuse base <br> - hanging type <br> III - standing type | Rated voltage 36 kV | Additional designation |

## 5. COMPLIANCE WITH STANDARDS

### 5.1 The fuse-links meet the requirements of the following standards:

- Polish Standard PN-77/E-06110
- British Standard BS:2692:1956
- Russian Standard GOST 2213:1959


### 5.2 The fuse-bases meet the requirements of the following standards:

- Polish Standard PN-77/E-06110
- German Standard VDE 0670 Teil 4/3 1967
- International Standard IEC 282-1 of 1985


## 6. HOW TO ORDER

Order by specyfying the product name, type symbol, rated value, rated current and quantity. All additional demands which are not listed in this Catalogue should be agreed with the manufacturer by means of an Inquiry where the sources of requirements (regulations, standards, etc.) are to be apecified.

### 6.1 Order example

1. Type WBP-6 fuse-link for a rated voltage of 7.2 kV and rated current of $0,7 \mathrm{~A}-10$ pcs
2. Type PBPM-6 Indoor fuse-base for a rated voltage of $7,2 \mathrm{kV}-20 \mathrm{pcs}$
${ }^{1)}$ Insulating tube is made from glass (WBP) or porcelain (BRT)

## 7. SPECIFICATIONS

### 7.1 Technical data of fuse-links

Table 2

| Fuse-link Type | Rated Voltage | Frequency | Rated current | Rated Breaking Current | Rated Breaking Capacity | Over-voltages | Weight | Resi | ance | Fuse-base Type |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\mathrm{U}_{\mathrm{n}}$ | f | $\mathrm{I}_{\mathrm{n}}$ | $\mathrm{I}_{\text {ws }}$ | $\mathrm{S}_{\text {ws }}$ | $\mathrm{U}_{\mathrm{m}}$ |  | Min. | Max. |  |
|  | kV | Hz | A | kA | MVA | kV | kg | $\Omega$ | $\Omega$ |  |
| WBP-6 | 7,2 | 50 or 60 | 0,7 | 120 | >1500 | <23 | 0,12 | 42 | 52 | PBPM-6 |
| WBP-10 | 12 |  | 0,6 | 72 |  | <38 | 0,16 | 62 | 72 | PBPM-10 |
| WBP-20 | 24 |  | 0,5 | 36 |  | <75 | 0,20 | 135 | 165 | PBPM-20 |
| WBP-30 | 36 |  | 0,4 | 24 |  | <112 | 0,25 | 225 | 275 | PBPM-30 |
| BRT-6 | 7,2/12 | 50 or 60 | 0,8 | 802/48 | >1000 | <23 | 1,8 | 57 | 63 | - |
| BRT-15 | 17,5/24 |  |  | $33^{3 /} / 24$ |  | <55 | 2,2 | 144 | 156 | PBPN-24-1 |
| BRT-30 | 36 |  |  | 16 |  | <112 | 2,6 | 290 | 310 | PBWMNI36 w.II-1 <br> PBWMNIII 36 w.II-1 |

The resistance are to be measured by an electrical bridge method or technical method using measuring instrument with accuracy class not worse than $0.5 \%$ at an ambient temperature of $t=20^{\circ} \mathrm{C} \pm 2^{\circ} \mathrm{C}$.
$\begin{array}{ll}\text { 2) for } U_{n}=12 \mathrm{kV} & I_{w s}=48 \mathrm{kA} \\ { }^{3)} \text { for } U_{n}=24 \mathrm{kV} & I_{w s}=24 \mathrm{kA}\end{array}$
Note: In case of installation of WBP fuses in closed housing and similar equipment characterised by heat exchange (stabilised ambient air temperature exceeds $+40^{\circ} \mathrm{C}$ ) the value of nominal current $\ln$ should be reduced by 0.1 A .

## Voltage Transformer Fuses

## Indoor - WBP Outdoor - BRT

### 7.2 Technical data of fuse-bases

Table 3

| Type of fuse-base | Rated voltage | Frequency | Impulse of | d voltage on | 50 Hz w of | voltage on |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $U_{n}$ | f | to earth | in pole | to earth | in pole | of fuse-link |
|  | kV | Hz | kV | kV | kV | kV |  |
| PBPM-6 | 7,2 | 50 or 60 | 60 | 70 | 27 | 35 | WBP-6 |
| PBPM-10 | 12 |  | 75 | 85 | 35 | 45 | WBP-10 |
| PBPM-20 | 24 |  | 125 | 145 | 55 | 75 | WBP-20 |
| PBPM-30 | 36 |  | 170 | 200 | 75 | 100 | WBP-30 |
| PBPN-24-1 | 24 |  | 125 | 145 | 55 | 75 | BRT-15 |
| PBWMNI 36 w.II-1 | 36 |  | 170 | 195 | 70 | 85 | BRT-30 |
| PBWMNIII 36 w.ll-1 | 36 |  | 170 | 195 | 70 | 80 |  |

PBPM - an indoor fuse-base with resin insulators
PBPN - an outdoor suspended fuse-base on 24 kV
PBWMNI 36 w.II-1 - an outdoor suspended fuse-base on 36 kV
PBWMNIII 36 w.II-1 - an outdoor fuse-base on 36 kV

## Recommendation of fuse links selection for MV voltage transformer protection

ABB Sp. z o.o. recommends using instrument transformers fuse elements type WBT from our production portfolio as protection for ABB's voltage transformers types UMZ and UDZ equipped with fuse holder. Using instrument transformer fuses has two main functions; to protect distribution equipment against results of internal voltage transformers short circuits and to reduce probability of explosion possibility in case of damage of internal isolation of voltage transformers.
The selection of fuse element for protection of voltage transformer should be done mainly in dependence on rated primary voltage of voltage transformer*. The rated voltage of fuse element should be equal or higher of (phase to phase) rated voltage for primary winding of voltage transformer, for example for VT type UMZ 15-1 working with voltage $\sqrt{ } 3 \mathrm{kV}$ on primary winding, one should select fuse link type WBP-10 that rated voltage is 10 kV .
The rated current of fuse links type WBP was reduced from $0,8 \mathrm{~A}$ to $0,4-0,7 \mathrm{~A}$ (depending on $\mathrm{U}_{n}$ ) starting from January 2001. The reason of this change was to improve cooperation between fuse link and voltage transformers.
Comparison of past voltage transformer fuse links type WBP with the new one is presented in the table below:
ABB Sp. z o.o. recommends to use new fuse links with limited rated current ( $0,4-0,7 \mathrm{~A}$ ) for protection voltage transformers type UMZ and UDZ instead of using former ones with rated current 0,8A.

| Fuse-link Type | Rated Voltage | Rated continuous <br> (till 12.2000) | Current continuous current <br> (from 01.2001) |
| :---: | :---: | :---: | :---: |
|  | $\mathbf{U}_{\mathrm{n}}$ | $\mathbf{I}_{\mathrm{n}}$ | $\mathbf{I}_{\mathrm{n}}$ |
|  | $\mathbf{k V}$ | $\mathbf{A}$ | $\mathbf{A}$ |
| WBP-6 | 7,2 |  | 0,7 |
| WBP-10 | 12 | 0,8 | 0,6 |
| WBP-20 | 24 |  | 0,5 |
| WBP-30 | 36 |  | 0,4 |

* In rarely cases when the following criteria have been fulfilled:

1) instrument transformer is used with rated primary voltage below 3000 V ;
2) power taken from instrument transformer is much higher then rated power output and it is close to the limit of thermal power output; the user should contact producer (ABB sp. z o.o.) to be individually advised regarding proper selection of voltage transformer protection.

## Voltage Transformer Fuses

## Indoor - WBP Outdoor - BRT

## 8. DIMENSIONAL DRAWINGS

Dimensional drawing of WBP type fuse-links


Notes:
Connections: silver-plated cooper.
Deviations of dimensions with no tolerance specified shall be within $\pm 3 \%$.

| Fuse-link type | Dimensions [mm] |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | e | D | $\varnothing \mathrm{A}$ | ØB |
| WBP-30 | $385 \pm 3$ | 25 | 18 | 23 |
| WBP-20 | $310 \pm 3$ | 25 | 18 | 23 |
| WBP-10 | $250 \pm 3$ | 25 | 18 | 23 |
| WBP-6 | $210 \pm 3$ | 25 | 18 | 23 |

B15/04.00 - Dimensional drawing of BRT type fuse-links


Notes:
Connections: silver-plated cooper.
Deviations of dimensions with no tolerance specified shall be within $\pm 3 \%$.

| Fuse-link type | Dimensions [mm] |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | e | D | $\varnothing \mathrm{A}$ | $\varnothing \mathrm{B}$ | $\varnothing \mathrm{C}$ |  |
| BRT-30 | $469 \pm 1,5$ | 50 | 54 | 62 | 68 |  |
| BRT-15 | $393 \pm 1,5$ | 50 | 54 | 62 | 68 |  |
| BRT-6 | $311 \pm 1,5$ | 50 | 54 | 62 | 68 |  |

## Voltage Transformer Fuses

## Indoor - WBP Outdoor - BRT

Dimensional drawing of PBPM-6 and PBPM-10 type fuse-bases


| Fuse-base type | Dimensions [mm] |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | ØD | E |
| PBPM-6 | $170 \pm 2$ | $200 \pm 2$ | 245 | 110 | 95 | 62,5 | 165 | 128 | 50 | 23 |
| PBPM-10 | $210 \pm 2$ | $240 \pm 2$ | 285 | 150 | 95 | 62,5 | 190 | 153 | 50 | 23 |

## Dimensional drawing of PBPM-20 and PBPM-20 type fuse-bases



## Voltage Transformer Fuses

## Indoor - WBP Outdoor - BRT

Dimensional drawing of PBPN-24-1 and PBWMNI 36 w.II-1 type fuse-bases


| Fuse-base type | Dimensions [mm] |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | ØD | E |
| PBPN-24-1 | $297 \pm 2$ | $357 \pm 2$ | 467 | 127 | 223 | 159,5 | 417 | 336 | 145 | 62 |
| PBWMNI 36 w.II-1 | $375 \pm 2$ | $435 \pm 2$ | 545 | 205 | 263 | 159,5 | 559 | 476 | 175 | 62 |

## Dimensional drawing of PBWMNIII 36 w.II-1 type fuse-bases



| Fuse-base type | Dimensions [mm] |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | ØD | E |
| PBWMNIII 36 w.II-1 | $375 \pm 2$ | $435 \pm 2$ | 545 | 205 | 263 | 159,5 | 559 | 476 | 175 | 62 |

## Indoor Railway DC Fuses

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## Indoor Railway DC Fuses

## type WBT

## 1. FEATURES

- High rupturing capacity
- Short circuit current limiting
- Low switching voltages
- R1, P1 fire-protection grade for the materials used - in accordance with PN-84/K-02500.


## 2. APPLICATIONS

The fuse-links for traction applications are used to protect traction substation and electric traction rolling stock equipment against the effects of overloads greater than 2 xl and of short-circuits at voltages of 1.9 kV DC and 4 kV DC. For detailed applications of particular types of the products refer toTable 1.

## 3. CLIMATIC WORKING CONDITIONS

Fuse bases type PBWMI can be operated at indoor conditions at ambient temperatures of $-5^{\circ} \mathrm{C}$ to $+50^{\circ} \mathrm{C}$. Other parameters are presented below. The fuse-links and fuse-boards can be operated at indoor conditions or, when enclosed in sealed boxes secured under the railway car, under the following environmental conditions:

- at ambient temperatures of $-30^{\circ} \mathrm{C}$ to $+50^{\circ} \mathrm{C}$,
- at relative humidity of ambient air of $95 \%$ at a temperature of $+20^{\circ} \mathrm{C}$.
- 1200 m altitude

Operating in other conditions requirers approval from the manufacturer.

## 4. DESIGNATIONS, VERSIONS

### 4.1 Marking system

The marking system for particular fuse-link, fuse base or fuse-board has three alphanumerical sections as shown in the following diagram.

| WBTI | 3 | / | 3 |
| :---: | :---: | :---: | :---: |
| Fuse-link type | Rated voltage | Rated current |  |
| TBT2 | 3 | / | 20 |
| Fuse-board base type current | Rated voltage |  | rrent |

Note: A spring-loaded indicator for the WBTI-3, WBTG-3,WBTGI-3 fuse-links is available as an option. W-letter is to be added to the type symbol of a fuse-link if you would like to order a fuse-link fitted with an indicator.
e.g., WBTIW- / 0 - fuse-link fitted with an indicator WBTI- / 0 - fuse-link without indicator.

## 5. TECHNICAL DATA

The general technical data of the fuse-links are presented in Table 3. The general technical data of the fuseboards are presented in Table 4.

## 6. COMPLIANCE WITH STANDARDS

The fuse-links for traction applications meet the requirements specified in Table 2.

## 7. HOW TO ORDER

Order by specifying the following:

- product name,
- type symbol,
- rated voltage,
- rated current,
- quantity.

All additional requirements, which are not listed in this Catalogue, should be agreed with the manufacturer.

## Indoor Railway DC Fuses

## 8. ORDER EXAMPLE

1. Type WBTI-3/30 fuse-link for traction applications for rated voltage 4 kV , rated current $20 \mathrm{~A}-20$ pcs.
2. Type TBT2-3/20 fuse-board for traction applications for rated voltage 4 kV , rated current $20 \mathrm{~A}-20 \mathrm{pcs}$.
3. Type WBTIW- $3 / 30$ fuse-link for traction applications for rated voltage 4 kV , rated current 20 A , fitted with an operation indicator - 20 pcs.

Table 1.

| Fuse-link type | Fuse-base/board ${ }^{1}$ type | Applications |
| :---: | :---: | :---: |
| WBTI-3/3 to 20 | PBWMI-6/20 | Protection against the effects of short-circuits and overloads in the electric circuits of railway traction substation equipment. |
| WBTI-3/25 to 50 | PBWMI-6/50 |  |
| WBTI-3/3 to 20 | TBT2-3/20 TBT2-3/20 \& 50 TBTS2-3/20 TBTS2-3/20 \& 50 | Protection against the effects of short-circuits and overloads in the electric circuits of traction vehicles, rail-coach space-heating equipment and electric locomotive. |
| WBTI-3/25 to 50 | TBT2-3/50 |  |
| WBTG-3/3; 4; 6 | TBTG1-3/6 | Protection against the effects of short-sircuits and overloads in electric single and multi-voltage circuits of rail-coach space-heating equipment. |
| WBTG-3/3-I | TBG-3/3-I |  |
| WBTGI-3/10; 16; 20 | PBPM-6 | Protection against the effect of short-circuits and overloads in the electric single-and multi- voltage circuits of rail-coach space-heating equipment as well as other d.c. circuits at traction vehicles. Dimensions of these fuse-links meet the requirements of German Standards DIN 43625. |
| WBTS-3/0,6; 1 | TBTS1-3/1 | Protection against the effects of short-circuits and overloads in the voltage measurement circuits and special electric equipment in traction vehicles, if the nominal loads are lower than 1 A . |
| WBT-1,5/3; 15; 40 | PBT-1,5/40 | Protection against the effects of short-circuits and overloads in the electric circuits of traction substation equipment and vehicles operating at a rated voltage not higher than 1900 V DC |
| WBTS-3 WBTG-3 WBTGI-3 | $\begin{gathered} \text { TBTG3-3/1; 6; } 15 \\ \text { TBTG4-3/1; 3; 6; } 15 \end{gathered}$ | A device for carrying replaceable parts in the form of types WBTS, WBTG, and WBTGI mounted outside electric circuits in electric locomotive. |

${ }^{1)}$ The specified fuse-boards and fuse-bases will operate with fuse-links selected acc.
Table 1. Other configurations should be agreed with the manufacturer.
Table 2.

| Product type | Compilance with Standards |
| :---: | :---: |
| WBTI-3/3 to 50 | PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968 as well as UIC 552V Sheets, VII edition |
| WBTG-3/3 to 6 WBTG-3/3-I | PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968 as well as UIC 552 Sheets of 1993 |
| WBTGI-3/10 to 20 | VII edition PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. DIN 43625 in scope of dimensional requirements General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968 as well as UIC 552V Sheets, |
| WBTS-3/0,6; 1 | PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968 |
| WBT-1,5/3; 15; 40 PBT-1,5/40 | WTO-67/ZPM Technical Requirements and AE/A10-15004 |

[^1]PN-69/E-06120 and BN-70/3086-14 and IEC Publ. 77 of 1968 in the scope specified above.

## Indoor Railway DC Fuses

## type WBT

Table 3. General technical data of fuse-links for traction applications

| Fuse link type | Rated Voltage | Rated Current |  | Switching Overvolt. | Rated Breaking Current | Weight | Resistance |  | Fuse-base type |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\begin{gathered} \text { ace. } \\ \text { BN-70 3086-14 } \end{gathered}$ | $\begin{gathered} \text { ace. } \\ \text { UIC-552 } \end{gathered}$ |  |  |  |  |  |  |
|  | $U_{n}$ | $\mathrm{I}_{\mathrm{n}}$ | $\mathrm{I}_{\mathrm{n}}$ | $\mathrm{U}_{\mathrm{m}}$ | $\mathrm{I}_{\text {ws }}$ |  | Min. | Max |  |
|  | kV DC | A DC | A DC | kV | kA | kg | $\mathrm{m} \Omega$ | $\mathrm{m} \Omega$ |  |
| WBTI-3/3 | $3,750^{1}$ | 3 | 3,5 | $<12$ | 31,5 | 1,5 | 516,6 | 631,4 | PBWMI-6/20 |
| WBTI-3/6 |  | 6 | 7 |  |  |  | 189 | 231 | TBT2-3/20 |
| WBTI-3/10 |  | 10 | 10 |  |  |  | 130,5 | 159,5 | TBT2-3/20 \& 50 |
| WBTI-3/16 |  | 16 | 16 |  |  |  | 64,8 | 79,2 | TBTS2-3/20 |
| WBTI-3/20 |  | 20 | 20 |  |  |  | 41,4 | 50,6 | TBTS2-3/20 \& 50 |
| WBTI-3/25 |  | 25 | 25 |  |  | 2,3 | 33,3 | 40,7 | PBWMI-6/50 |
| WBTI-3/32 |  | 32 | 32 |  |  |  | 28,8 | 35,2 | TBT2-3/50 |
| WBTI-3/40 |  | 40 | 36 |  |  |  | 20,7 | 25,3 | TBT2-3/20 \& 50 |
| WBTI-3/50 |  | 50 | 48 |  |  |  | 15,8 | 19,25 | TBTS2-3/20 \& 50 |


| Fuse link type | Rated Voltage | Rated Current |  | Switching Overvolt. | Rated Breaking Current | Weight | Resistance |  | Fuse-base type |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ace. BN-70 3086-14 | $\begin{aligned} & \text { ace. } \\ & \text { UIc-552 } \end{aligned}$ |  |  |  |  |  |  |
|  | $U_{n}$ | $\mathrm{I}_{\mathrm{n}}$ | $\mathrm{I}_{\mathrm{n}}$ | $U_{\text {m }}$ | $\mathrm{I}_{\text {ws }}$ |  | Min. | Max |  |
|  | kV DC | A DC | A DC | kV | kA | kg | $\mathrm{m} \Omega$ | $\mathrm{m} \Omega$ |  |
| WBTGI-3/10 | 3,750 | 10 | 10 | $<12$ | 31,5 | 0,65 | 137,7 | 168,3 | TBTG1A-3/15 |
| WBTGI-3/16 |  | 16 | 16 |  |  |  | 69,3 | 84,7 |  |
| WBTGI-3/20 |  | 20 | 20 |  |  |  | 45,1 | 55,3 |  |
| WBTG-3/3-I | 4 | 3 | 3 | <12 | 40 | 0,13 | 569,7 | 696,3 | PBPM-6 |
| WBTG-3/3 | 4 | 3 | 3 | $<12$ | 40 | 0,22 | 569,7 | 696,3 | TBTG1-3/6 |
| WBTG-3/4 |  | 3,5 | 4 |  |  |  | 459 | 561 |  |
| WBTG-3/6 |  | 6 | 6 |  |  |  | 300,6 | 367,4 |  |
| WBTS-3/0,6 | 4 | 0,6 | - | <12 | 40 | 0,08 | 42( $\Omega$ ) | 51,3( $\Omega$ ) | TBTS1-3/1 |
| WBTS-3/1 |  | 1 | - |  |  |  | 1710 | 2090 |  |
| WBT-1,5/3 | 1,9 | 3 | - | <6 | 50 | 0,5 | 234 | 316 | PBT-1,5/40 |
| WBT-1,5/15 |  | 15 | - |  |  |  | 28,2 | 38,2 |  |
| WBT-1,5/40 |  | 40 | - |  |  | 1.25 | 11,3 | 15,3 |  |

*' Minimum breaking current $\operatorname{Imin}=1.6 \times \ln$
${ }^{11}$ While testing the breaking capacity satisfactory results were found for the short circuits range at a recovery voltage of 4000 V DC and for the overload currents at a recovery voltage of $3800-4000 \mathrm{~V}$ DC various values for particular fuse-links were obtained. 21 This is a fuse housing for fuse-links for traction applications manufactured at ABB Factory at Przasnysz. The resistance are to be measured by a electrical bridge method or technical metod using measuring instrument with accuracy class not worse than $0.5 \%$ at an ambient temperature of $t=20^{\circ} \mathrm{C} \pm 2^{\circ} \mathrm{C}$.

Table 4. General technical data of fuse-boards

| Fuse board type | Rated Voltage | Rated Current | Rated test voltage at 50 Hz | Number of poles | Weight | Fuse - link type |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\mathrm{U}_{\mathrm{n}}$ | $\mathrm{I}_{\mathrm{n}}$ | $\mathrm{U}_{\mathrm{n} \mid}$ |  |  |  |
|  | $\mathrm{kV}=$ | A= | kV | pcs | kg |  |
| PBWMI-6/20 | 7,2 | 20 | 351) | 1 | 4,9 | WBTI-3/3 $\div 20$ |
| PBWMI-6/50 |  | 40 |  |  | 5 | WBTI-3/25 $\div 50$ |
| TBT2-3/20 | 4 | 20 | 10 | 2 | 5,5 | WBTI-3/3 20 (2 pcs) |
| TBT2-3/20 \& 50²) |  | $20 \& 50$ |  |  | 5,65 | WBTI-3/3 $\div 20$ ( 1 pcs ) WBTI-3/25 $\div 50$ (1 pcs) |
| TBT2-3/50 |  | 50 |  |  | 5,8 | WBTI-3/25 50 (2 pcs) |
| TBTS2-3/20 |  | 20 |  |  | 7,0 | WBTI-3/3 -20 (2 pcs) |
| TBTS2-3/20 \& 50 |  | 20\&50 |  | 2 | 7,3 | WBTI-3/3 $\div 20$ (1 pcs) WBTI-3/25 $\div 50$ (1 pcs) |
| TBTG1A-3/15 |  | 20 |  | 1 | 1,15 | WBTGI-3/10; 16; 20 |
| TBTG1-3/6 |  | 6 |  |  | 0,85 | WBTG-3/3;4;6 |
| TBTG3-3/1;6;15 | - | - | - | 3 | 1,8 | WBTS-3/1 WBTG-3/3;4;6 WBTGI-3/10; 16;20 |
| TBTG4-3/1;3;6;15 | - | - | - | 4 | 2,6 | WBTS-3/1 WBTG-3/3;4;6 WBTGI-3/10; 16;20 |
| TBTS1-3/1 | 4 | 1 | 10 | 1 | 0,35 | WBTS-3/0,6;1 |
| PBT-1,5/40 | 1,9 | 40 | $\begin{aligned} & 27^{11} \\ & 35^{3 i} \end{aligned}$ | 1 | 3,6 | WBT-1,5/3 WBT-1,5/15 WBT-1,5/40 |

Note: Due to the introduction of improvements, the right is reserved to modify the products.
${ }^{\text {1) }}$ AC contact-to-contact insulation test voltage.
${ }^{\text {2) }}$ One pole is designed for fixing the type WBTI- $3 / 3$ to 20 fuse-link and the second one for WBTI- $3 / 25$ to 50 fuse-link.
${ }^{3}$ ) $A C$ earth insulation test voltage.

## Indoor Railway DC Fuses

## 9. APPENDICES

Fig. 1 Cut-off current characteristics for fuse-link types WBTI-3...


Fig. 2 Time-current characteristics for fuse-link types WBTI-3 ...
Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20 \%$


## Indoor Railway DC Fuses

## type WBT

Fig. 3 Cut-off current characteristics fuse-link types WBTGI-3 ...


Fig. 4 Time-current characteristics for the fuse-link types WBTGI-3 ...
Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20 \%$


## Indoor Railway DC Fuses

Fig. 5 Cut-off current characteristics for fuse-link types WBTG-3/3; 4; 6 ... and WBTG-3/3-I


Fig. 6 Time-current characteristics for fuse-link types WBTG-3/3; 4; 6 ... and WBTG-3/3-I Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20 \%$.


## Indoor Railway DC Fuses

## type WBT

Fig. 7 Cut-off current characteristics for fuse-link types WBTS-3/0,6; 1


Fig. 8 Time-current characteristics for fuse-link types WBTS-3/0,6; 1
Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20 \%$.


## Indoor Railway DC Fuses

Fig. 9 Cut-off current characteristics for fuse-link types WBT-1,5/3; 15; 40


Fig. 10 Time-current characteristics for fuse-link types WBT-1,5/3; 15; 40
Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20 \%$.


## Indoor Railway DC Fuses

## type WBT

WBTI-3, WBTG-3, WBTGI-3,
WBTG-3/3-I,WBTS-3 and WBT-1,5
fuse-links for traction applications

| Fuse-link type | Dimensions [mm] |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\emptyset A$ | ØD | $\varnothing \subset$ | K | E | e |
| WBTI-3/3 to 20 | 55 | 62 | 66 | 50 | 20 | $256 \pm 2$ |
| WBTI-3/25 to 50 | 70 | 78 | 84 |  |  |  |
| WBTGI-3/10 to 20 | 38 | 45 | 50 | 33 |  | $256 \pm 2$ |
| WBTG-3/3-I | 18 | 23 | - | 25 | - | $209 \pm 2$ |
| WBTG-3/3 to 6 | 24 | 28 | - | 20 | 12 | $200 \pm 2$ |
| WBTI-3/0.6; 1 | 18 | 23 | - | 25 | - | $145 \pm 2$ |
| WBT-1,5/3;15 | 38 | 45 | 50 | 33 | - | $109 \pm 2$ |
| WBT-1,5/40 | 65 | 72 | - | - | - | $109 \pm 2$ |

## BWT fuse-links for traction applications

DC fuse-links for railway applications, characterized by small dimensions, high rupturing capacity, current-limitation and low switching voltage. Type tested according to 'Specifica Generale per la Fornitura di Valvole Fusibili A.T. per Circuiti C.C'. at Trenitalia (Italian Railways) testing station in Empoli/Italy.

## Technical parameters:

| Rated voltage | $U_{n}$ | 3 kV DC |
| :--- | :--- | :--- |
| Rated current | $I_{n}$ | $3.15 ; 16 ; 20 \mathrm{~A}$ |
| Switching voltage (max) | $\mathrm{U}_{\mathrm{m}}$ | 12 kV |
| Minimum breaking current | $\mathrm{I}_{\text {min }}$ | $1.6 \times \mathrm{I}_{\mathrm{n}}$ |
| Maximum breaking current | $\mathrm{I}_{\text {ws }}$ | 60 kA |



Type WBTI-3-3/...Fuse-links


Type WBTGI-3/...; WBT-1,5/3 ... Fuse-links


Type WBT-1,5/40 Fuselinks


Type BWT fuse-links


Type WBTG-3/3-6,
WBTG-3/3-I,WBTS-3/... Fuse-links

## Indoor Railway DC Fuses

## type WBT

TBT2-3/...; TBT2-3/20\&50; TBTS2-3/20 and TBTS2-3/20\&50 fuse-boardsfor traction applications

1. Connection screw, M12, for the board type TBT2-3/50 only.
2. Connection screw - M8 for the ØD1 pole or M5 for the ØD2 pole-for the board typeTBT2-3/20 \& 50 only.
3. Poles designed for the fuse-links type WBT-3/20-50 fitted with extrathimble terminals.
4. Flat connections employing a screw, M8 are fitted in theTBTS2-3/... only. Connections: silver-plated brass Contact Springs: silver-plated brass
Deviations of dimensions with no tolerance specified shall be within $\pm 3 \%$.

| Fuse-board type | Dimensions [mm] |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\varnothing$ A1 | $\varnothing$ A2 | A3 | B1 | B2 | B3 |
| TBT2-3/20 | 62 | 62 | - | 136 | 30 | - |
| TBT2-3/50 | 78 | 78 | - | 136 | - | 40 |
| TBT2-3/20 \& 50 | 78 | 62 | - | 138 | 40 |  |
| TBTS2-3/20 | 62 | 62 | 295 | 138 | - | - |
| TBTS2-3/20 \& 50 | 62 | 78 | 295 | 138 | - |  |



## Indoor Railway DC Fuses

## type WBT

TBTG3-3/1; 6; 15 and TBTG4-3/1; 3; 6; 15 fuse-boards for traction applications


1. Connections: silver-plated brass
2. Contact Springs: silver-plated brass
3. Deviations of dimensions with no tolerance specified shall be within $\pm 3 \%$.

| Fuse-board type | Dimensions [mm] |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 |
| TBTG3-/1,6,15 | 330 | 300 | $220 \pm 1$ | $180 \pm 1$ | 120 | 250 | 220 | 190 | 110 | - | 40 |
| TBT4-3/1,3,6,15 | 330 | 300 | $220 \pm 1$ | $180 \pm 1$ | 120 | 330 | 300 | 265 | 185 | 115 | 50 |

TBTG1-3/6; TBTG1A-3/15; TBTS1-3/1 Fuse-boards for traction applications


| Fuse-board type | Dimensions [mm] |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | A1 | A2 | A3 | A4 | B1 | B2 | C1 | C2 | C3 | C4 |
| TBTG1-3/6 | 165 $\pm 1,5$ | $180 \pm 3$ | $395 \pm 3$ | 425 | 18 | $58 \pm 2$ | M5 | $70 \pm 2$ | 100 | 28 |
| TBTG1A-3/15 | 205 $\pm 1,5$ | $225 \pm 3$ | $440 \pm 3$ | 470 | 25 | $71 \pm 2$ | M8 | $70 \pm 2$ | 100 | 45 |
| TBTS1-3/1 | $105 \pm 1$ | $120 \pm 3$ | $394 \pm 3$ | 425 | 20 | 60 | M5 | - | 50 | 23 |

## Type PBT-1,5/40

Fuse-base for traction application


## Indoor Fuse Bases

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## Indoor Fuse Bases

## Fuse links type BPS

## 1. FEATURES

- Suitable for all types of high power fuse links fitted with Ø45mm contact,
- May co-operate with switching station auxiliary and control circuits,
- Small overall dimensions.


## 2. APPLICATION

The fuse bases BPS-type are intended for fixing medium voltage fuse links fitted with a striker. The base can be applied in case of fuse links protecting transformer circuits as well as in case of fuse links protecting motor circuits. The use of these bases makes it possible to signal the fuse blow in the signalling circuits of the switching station.

## 3. OPERATING CONDITIONS

The fuse bases BPS-type are designed for indoor applications in temperate climate conditions.
The fuse bases BPS-type can be mounted in a vertical or horizontal position, which enables easy replacement the fuse link.

## 4. VERSIONS AND MARKING

Marking of the three-pole fuse base for voltage 7.2 kV is composed of two letter-digit segments: BPS-01. The two-piece base is powder painted and is fitted with a resin insulator. The base pole pitch amounts to 112 mm . The catalogue number of this base is: 1YMB507101M0001.

The table below presents the different versions of single pole BPS-type fuse bases.

## Table 1

|  | Fuse base type | Rated volgage [kV] | Version | Coating | Post-insulators | Fuse link -e-dimension [ mm ] | Catalogue number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | BPS | 7,2 | 1 (*) | zinc | resin | 192 | 1YMB507102M0001 |
| 2 | BPS | 7,2 | $1{ }^{*}$ ) | zinc | resin | 292 | 1YMB507102M0003 |
| 3 | BPS | 12 | 1 (*) | zinc | resin | 292 | 1YMB507102M0005 |
| 4 | BPS | 12 | $1{ }^{*}$ ) | zinc | porcelain | 292 | 1YMB507102M0006 |
| 5 | BPS | 12 | $1{ }^{*}$ ) | zinc | resin | 442 | 1YMB507102M0007 |
| 6 | BPS | 12 | $1{ }^{*}$ ) | zinc | porcelain | 442 | 1YMB507102M0008 |
| 7 | BPS | 17,5 | $1{ }^{*}$ ) | zinc | resin | 292 | 1YMB507102M0009 |
| 8 | BPS | 17,5 | $1{ }^{*}$ ) | zinc | porcelain | 292 | 1YMB507102M0010 |
| 9 | BPS | 24 | $1{ }^{*}$ ) | zinc | resin | 442 | 1YMB507102M0013 |
| 10 | BPS | 24 | $1{ }^{*}$ ) | zinc | porcelain | 442 | 1YMB507102M0014 |
| 11 | BPS | 24 | $1{ }^{*}$ ) | zinc | resin | 537 | 1YMB507102M0015 |
| 12 | BPS | 24 | $1{ }^{*}$ ) | zinc | porcelain | 537 | 1YMB507102M0016 |
| 13 | BPS | 27 | $1{ }^{*}$ ) | zinc | resin | 442 | 1YMB507102M0017 |
| 14 | BPS | 27 | $1{ }^{*}$ ) | zinc | porcelain | 442 | 1YMB507102M0018 |
| 15 | BPS | 36 | $1{ }^{*}$ ) | zinc | resin | 537 | 1YMB507102M0021 |
| 16 | BPS | 36 | $1{ }^{*}$ ) | zinc | porcelain | 537 | 1YMB507102M0022 |
| 17 | BPS | 7,2 | $1{ }^{*}$ ) | powder paint | resin | 192 | 1YMB507102M0031 |
| 18 | BPS | 7,2 | $1{ }^{*}$ ) | powder paint | resin | 292 | 1YMB507102M0033 |
| 19 | BPS | 12 | $1{ }^{*}$ ) | powder paint | resin | 292 | 1YMB507102M0035 |
| 20 | BPS | 12 | $1{ }^{*}$ ) | powder paint | porcelain | 292 | 1YMB507102M0036 |
| 21 | BPS | 12 | $1{ }^{*}$ ) | powder paint | resin | 442 | 1YMB507102M0037 |
| 22 | BPS | 12 | $1{ }^{*}$ ) | powder paint | porcelain | 442 | 1YMB507102M0038 |
| 23 | BPS | 17,5 | $1{ }^{*}$ ) | powder paint | resin | 292 | 1YMB507102M0039 |
| 24 | BPS | 17,5 | $1{ }^{*}$ ) | powder paint | porcelain | 292 | 1YMB507102M0040 |
| 25 | BPS | 24 | $1{ }^{*}$ ) | powder paint | resin | 442 | 1YMB507102M0043 |
| 26 | BPS | 24 | $1{ }^{*}$ ) | powder paint | porcelain | 442 | 1YMB507102M0044 |
| 27 | BPS | 24 | 1 (*) | powder paint | resin | 537 | 1YMB507102M0045 |


|  | Fuse base type | Rated volgage [kV] | Version | Coating | Post-insulators | Fuse link -e-dimension [mm] | Catalogue number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 27 | BPS | 24 | $1{ }^{*}$ ) | powder paint | resin | 537 | 1YMB507102M0045 |
| 28 | BPS | 24 | $1{ }^{*}$ ) | powder paint | porcelain | 537 | 1YMB507102M0046 |
| 29 | BPS | 27 | $1{ }^{*}$ ) | powder paint | resin | 442 | 1YMB507102M0047 |
| 30 | BPS | 27 | $1{ }^{*}$ ) | powder paint | porcelain | 442 | 1YMB507102M0048 |
| 31 | BPS | 36 | $1{ }^{*}$ ) | powder paint | resin | 537 | 1YMB507102M0051 |
| 32 | BPS | 36 | $1{ }^{*}$ ) | powder paint | porcelain | 537 | 1YMB507102M0052 |
| 33 | BPS | 7,2 | 2(*) | zinc | resin | any | 1YMB507103M0001 |
| 34 | BPS | 12 | $2(* *)$ | zinc | resin | any | 1YMB507103M0003 |
| 35 | BPS | 12 | 2(*) | zinc | porcelain | any | 1YMB507103M0004 |
| 36 | BPS | 24 | 2(*) | zinc | resin | any | 1YMB507103M0007 |
| 37 | BPS | 24 | 2(*) | zinc | porcelain | any | 1YMB507103M0008 |
| 38 | BPS | 36 | 2(**) | zinc | resin | any | 1YMB507103M0009 |
| 39 | BPS | 36 | 2(*) | zinc | porcelain | any | 1YMB507103M0010 |
| 40 | BPS | 7,2 | 2(*) | powder paint | resin | any | 1YMB507103M0013 |
| 41 | BPS | 12 | $2\left({ }^{* *}\right)$ | powder paint | resin | any | 1YMB507103M0015 |
| 42 | BPS | 12 | 2(*) | powder paint | porcelain | any | 1YMB507103M0016 |
| 43 | BPS | 24 | 2(*) | powder paint | resin | any | 1YMB507103M0019 |
| 44 | BPS | 24 | $2\left({ }^{* *}\right)$ | powder paint | porcelain | any | 1YMB507103M0020 |
| 45 | BPS | 36 | 2(**) | powder paint | resin | any | 1YMB507103M0021 |
| 46 | BPS | 36 | $2(* *)$ | powder paint | porcelain | any | 1YMB507103M0022 |

Remarks:
(*)- single pole one-piece fuse base
(**)- single pole two-piece fuse base
The single pole two-piece fuse base makes it possible to use fuse links with any „e" overall dimension

## 5. DESIGN AND PRINCIPLE OF OPERATION

### 5.1 The three-pole fuse base

The three pole fuse base BPS-type is composed of two separated steel bars fitted with M10 earthing terminals, and three indoor resin post-insulators fixed thereon. There are spring contacts and a terminal strip, fitted with M12 screw terminals for connecting to an electrical circuit, mounted on these insulators. The insulators are separated with the use of the insulating barriers, which ensure appropriate insulation between poles. Due to the use of the barriers the overall dimensions of the fuse base could be reduced. There is a tripping mechanism fixed to one of the bars. The mechanism consists of a lever system and a microswitch, being separate for each pole. The NC contacts of the microswitches are connected in series, whereas the circuit ends are connected to the terminals 1 and 2 of the terminal strip. In case of three operating fuse links being mounted in the base, the NC contacts of the microswitches are closed and the circuit between the terminals 1 and 2 of the terminal strip has continuity. The NO contacts of the microswitches are connected in parallel, whereas the circuit ends are connected to the terminals 3 and 4 of the terminal strip. In case of three operational fuse links being mounted on the fuse base, the NO contact of the microswitches are opened and the circuit between the terminals 3 and 4 of the terminal strip has no continuity.
If any of the fuse links is missing or the striker of one of the three fuse links is triggered, the circuit between the terminals 1 and 2 will open and the circuit between the terminals 3 and 4 will simultaneously close.

### 5.2 The single pole fuse base

The single pole fuse bases BPS-type are manufactured in two basic versions i.e. in the form of one-piece and two-piece device. The two-piece bases consist of two steel bars fitted with M10 earthing terminals and indoor resin post-insulators fixed on these bars. There are spring contacts and the terminal strip, with M12 screw terminals for connecting to electrical circuit, mounted on these insulators. In case of the one-piece version the bars with insulators are joined with a steel bar to make a single assembly. There is a tripping mechanism fixed to one of the bars. The mechanism consists of a lever system and a microswitch. The NC contacts of the microswitch are connected to the terminals 1 and 2, whereas the NO contacts are connected to the terminals 3 and 4 of the terminal strip. In case of an operating fuse link being mounted in the base, the NC contacts of microswitch are closed, whereas the NO contacts are opened. If the fuse link is missing or the fuse link striker is triggered the microswitch NC contacts will open and the NO contacts will close.

## Indoor Fuse Bases

Fuse links type BPS

## 6. CHARACTERISTICS

Table 2.

| Fuse base type | Fuse base voltage | Rated | Frequency | Rated uninterrupted current | Types of suitable fuse links |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Un | f | In |  |
|  |  | kV | Hz | A |  |
| BPS-01 | Three-pole | 7,2 | 50 or 60 | 315 | $\begin{gathered} \text { BWMW-7,2/ } 3,15 \div 100 \\ \text { CEF-7,2/ 6 } \div 200 \\ \text { CMF - } 7,2 / 63 \div 315 \end{gathered}$ |
| BPS7,2 | Single pole | 7,2 |  | 315 | $\begin{gathered} \text { BWMW-7.2/3.15-100 } \\ \text { CEF-7.2/6-200 } \\ \text { CMF-7.2/63-315 } \end{gathered}$ |
| BPS12 | Single pole | 12 |  | 200 | $\begin{gathered} \text { BWMW-12/3.15-100 } \\ \text { CEF-12/6-200 } \\ \text { CMF-12/63-200 } \end{gathered}$ |
| BPS17,5 | Single pole | 17,5 |  | 125 | CEF-17.5/6-63 |
| BPS 24 | Single pole | 24 |  | 125 | $\begin{gathered} \text { BWMW-24/3.15-63 } \\ \text { CEF-24/6-125 } \end{gathered}$ |
| BPS27 | Single pole | 27 |  | 100 | CEF-27/6-63 |
| BPS36 | Single pole | 36 |  | 40 | BWMW-36/3.15-40 <br> CEF-36/6-40 |

Note: We reserve the right to make changes due to technological development.

## 7. CONFORMITY WITH STANDARDS

The BPS fuse bases meet the requirements of the following standards:

- Polish Standard PN-77/E-06110
- International Standard IEC 60 282-1


## 8. ORDERING METHOD

The order must contain the following information: product name, type symbol, rated voltage, catalogue number and quantity of fuse bases.
All additional requirements not stated in this catalogue sheet must be agreed with manufacturer by an inquiry made in writing and stating the source of requirements (Regulations, Standards, etc.).

## 9. ORDER EXAMPLE

Three pole fuse base BPS-01 type, rated voltage 7.2 kV , catalogue number 1YMB507101M0001-20 pcs. Single pole one-piece fuse base with resin insulators, type BPS 12, rated voltage 12 kV , zinc plated, for fuse links with dimension e=292 mm, catalogue number 1YMB507102M0005, 10 pcs.
10. ENCLOSURES

1. Dimensioned drawings


| Dimensions |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Un | Fuse link dimension | A | B | C | H |
| kV | e/D | [mm] | [mm] | [mm] | [mm] |
| 7,2 | 192/Ø53, 192/Ø65, 192/Ø87 | 226+2 | 346+2 | 376+2 | 192土1(z) |
|  | 292/Ø53, 292/Ø65, 292/Ø87 | 326+2 | 446+2 | 476+2 |  |
| 12 | 292/Ø53, 292/Ø65, 292/Ø87 | 326+2 | 446+2 | 476+2 | $\begin{aligned} & 217 \pm 1(z) \\ & 218 \pm 1(p) \end{aligned}$ |
|  | 442/Ø53, 442/Ø65, 442/Ø87 | 476+2 | 596+2 | 626+2 |  |
| 17,5 | 292/Ø53, 292/Ø65, 292/Ø87 | 326+2 | 446+2 | 476+2 | $\begin{aligned} & 297 \pm 1(z) \\ & 312 \pm 1(p) \end{aligned}$ |
| 24 | 442/Ø53, 442/Ø65, 442/Ø87 | 476+2 | 596+2 | 626+2 | $\begin{aligned} & 297 \pm 1(z) \\ & 312 \pm 1(p) \end{aligned}$ |
|  | 537/Ø65, 537/Ø87 | $571+2$ | 691+2 | 721+2 |  |
| 27 | 442/Ø65, 442/Ø87 | 476+2 | 596+2 | 626+2 | $\begin{aligned} & 388 \pm 1(z) \\ & 389 \pm 1(p) \end{aligned}$ |
| 36 | 537/Ø65, 537/Ø87 | 571+2 | 691+2 | 721+2 | $\begin{aligned} & 388 \pm 1(z) \\ & 389 \pm 1(p) \end{aligned}$ |

## Indoor Fuse Bases

Fuse links type BPS


| Dimensions |  |  |
| :---: | :---: | :---: |
| Un | Fuse link dimension | H |
| [kV] | e/D | [mm] |
| 7,2 | 192/Ø53, 192/Ø65, 192/Ø87 | 192 1 1(z) |
|  | 292/Ø53, 292/Ø65, 292/Ø87, 367/Ø87 |  |
| 12 | 192/Ø53, 292/Ø53, 292/Ø65, 292/Ø87 | $\begin{aligned} & 217 \pm 1(\mathrm{z}) \\ & 218 \pm 1(\mathrm{p}) \end{aligned}$ |
|  | 442/Ø53, 442/Ø65, 442/Ø87, 537/Ø65, 537/Ø87 |  |
| 24 | 442/Ø53, 442/Ø65, 442/Ø87, 292/Ø53 | $\begin{aligned} & 297 \pm 1(z) \\ & 312 \pm 1(p) \end{aligned}$ |
|  | 537/Ø53, 537/Ø87 |  |
| 36 | 537/Ø53, 537/Ø87 | $\begin{aligned} & 388 \pm 1(z) \\ & 389 \pm 1(p) \end{aligned}$ |

## 2. Wiring diagrams of auxiliary circuits of the fuse bases.



## NOTES for three poles BPS

1. Contacts $1-2$ of one of the auxiliary switches K1, K2, K3 are open and contacts 3-4 are closed:
a) after fuse link striker has triggered,
b) in case of fuse link missing in the fuse holder.
2. Contacts $1-2$ of the auxiliary switches $\mathrm{K} 1, \mathrm{~K} 2$, K3 are closed, and contacts $3-4$ are opened when all three fuse link in the fuse holder is operational.
3. Use fuse links with striker only.
4. Install fuse links with striker in the fuse holder in the manner that the striker will be directed to the insulator with pull insulator.
5. K1: type $83135, \mathrm{Ui}=380 \mathrm{~V}$; $\mathrm{Ue}=380 \mathrm{~V}$, $\mathrm{le}=6 \mathrm{~A}, \mathrm{AC} 15$; $\mathrm{Ue}=220 \mathrm{~V}, \mathrm{le}=0.25 \mathrm{~A}, \mathrm{DC} 13$
6. X1: type LZ-B4/6, Ui = $500 \mathrm{~V} ; 4 \mathrm{~mm}^{2} \mathrm{Cu}$, IEC 947-7-1

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[^0]:    *) The K-factor is referred to the average value of current.

[^1]:    The fuse-boards for traction applications meet the requirements of the following Standards:

