

European Standard

For Installation Inside Transformers Under Oil



General purpose fuses installed in transformers

The installation of high-voltage fuse-links inside oil filled transformers provides space and cost savings in the total concept of distribution transformer substations. Furthermore they provide superior protection inside the so called "Intrinsically Safe Transformers".

For this purpose, the high voltage fuses are designed as general purpose fuse-links. The fuse-links will provide detection and cut-off of a widest possible range of fault currents.

As well as the desired protection of transformer tanks against bursting, they also interrupt.

The fuse-links fulfill all requirements regarding oiltightness during the manufacturing phase of the transformer itself and also during service operation. The fuse-links are safe up to continuous temperatures of 105°C and can withstand very high temperatures arising during vacuum impregnation of transformers.

The fuse-links are provided with threaded holes size M10 at their contact caps for easy installation inside the transformer.

The fuse is age resistant, owing to the specific design of the fuse element and the use of high grade ceramic as well as appropriate sealing methods. These fuse-links can be used inside oil filled transformers free of any ageing for many decades.

Because these fuses are fitted inside transformers under oil, they are subjected to severe stresses, like partial discharges, high temperatures and vacuum during filling and drying process of transformer during manufacture. Superior design and construction of our fuses and long positive field experience eliminate problems, which may be caused due to such stresses.

Summary of Advantages

- Space and cost saving in distribution transformer substation design
- Protection against short-circuit and internal transformer faults
- Protection against bursting of the transformer through specific characteristic of the fuse-link
- Resistance against ageing





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Selection Guide

| Rated Voltage AC [kV] | Class | Part No. | Selector Guide [Page] | Techn. Data [Page] |
|-----------------------------|-----------------|-----------|-----------------------------|--------------------------|
| 12 | General-purpose | 30 310 91 | HHO 3 | HHO 5 |
| 12 | Back-up | 30 310 11 | HHO 3 | HHO 5 |
| 17.5 | General-purpose | 30 311 91 | HHO 3 | HHO 5 |
| 24 | General-purpose | 30 312 91 | HHO 4 | HHO 6 |
| 24 | Back-up | 30 312 11 | HHO 4 | HHO 6 |
| 36 | Back-up | 30 323 11 | HHO 4 | HHO 6 |

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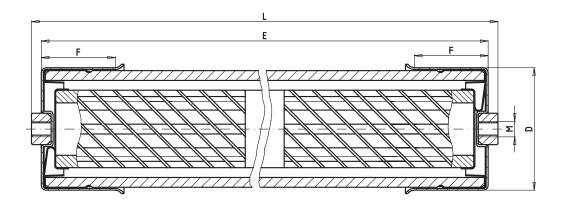
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| Rated Voltage | |
|---------------|----------|
| AC 12 kV | Oiltight |

| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Class | Weight [kg/1] | Pack |
|-------------------------|---------------|-----------------------------------|-----------------|---------------|------|
| 8 | 30 310 91.8 | 63 | General-purpose | 2.4 | 1 |
| 12 | 30 310 91.12 | 63 | General-purpose | 2.4 | 1 |
| 16 | 30 310 91.16 | 63 | General-purpose | 2.4 | 1 |
| 20 | 30 310 91.20 | 63 | General-purpose | 2.4 | 1 |
| 22 | 30 310 91.22 | 63 | General-purpose | 2.4 | 1 |
| 40 | 30 310 91.40 | 63 | General-purpose | 2.4 | 1 |
| 50 | 30 310 91.50 | 63 | General-purpose | 2.4 | 1 |
| 63 | 30 310 91.63 | 63 | General-purpose | 2.4 | 1 |
| 80 | 30 310 11.80 | 63 | Back-up | 2.4 | 1 |
| 100 | 30 310 11.100 | 63 | Back-up | 2.4 | 1 |
| 125 | 30 310 11.125 | 63 | Back-up | 2.4 | 1 |

| Rated Voltage | |
|---------------|----------|
| AC 17.5 kV | Oiltight |

| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Class | Weight [kg/1] | Pack |
|-------------------------|--------------|-----------------------------------|-----------------|---------------|------|
| 8 | 30 311 91.8 | 63 | General-purpose | 2.4 | 1 |
| 10 | 30 311 91.10 | 63 | General-purpose | 2.4 | 1 |
| 12 | 30 311 91.12 | 63 | General-purpose | 2.4 | 1 |
| 16 | 30 311 91.16 | 63 | General-purpose | 2.4 | 1 |
| 20 | 30 311 91.20 | 63 | General-purpose | 2.4 | 1 |



D 2.48" (63.5 mm)
E 14.17" (360 mm)
F 1.57" (40 mm)
L 14.60" (371 mm)
M M8





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| Rated Voltage | |
|---------------|----------|
| AC 24 kV | Oiltight |

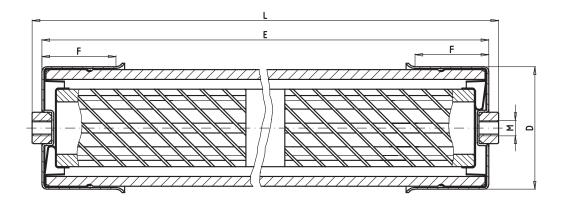
| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Class | Weight [kg/1] | Pack | |
|-------------------------|----------------|-----------------------------------|-----------------|---------------|------|--|
| 8 | 30 312 91.8 | 63 | General-purpose | 2.4 | 1 | |
| 12 | 30 312 91.12 | 63 | General-purpose | 2.4 | 1 | |
| 16 | 30 312 91.16 | 63 | General-purpose | 2.4 | 1 | |
| 20 | 30 312 91.20 | 63 | General-purpose | 2.4 | 1 | |
| 31.5 | 30 312 11.31.5 | 63 | Back-up | 2.4 | 1 | |
| 40 | 30 312 11.40 | 63 | Back-up | 2.4 | 1 | |
| 50 | 30 312 11.50 | 63 | Back-up | 2.4 | 1 | |
| 63 | 30 312 11.63 | 63 | Back-up | 2.4 | 1 | |
| 80 | 30 312 11.80 | 63 | Back-up | 2.4 | 1 | |

| Rated Voltage | |
|---------------|----------|
| AC 36 kV | Oiltight |

| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Class | Weight [kg/1] | Pack | |
|-------------------------|----------------|-----------------------------------|---------|---------------|------|--|
| 10 | 30 323 11.10 | 40 | Back-up | 2.4 | 1 | |
| 16 | 30 223 11.16 | 40 | Back-up | 2.4 | 1 | |
| 20 | 30 323 11.20 | 40 | Back-up | 2.4 | 1 | |
| 25 | 30 323 11.25 | 40 | Back-up | 2.4 | 1 | |
| 31.5* | 30 324 11.31.5 | 40 | Back-up | 2.4 | 1 | |
| 40* | 30 324 11.40 | 40 | Back-up | 2.4 | 1 | |

^{*} E= 17.32 " (440 mm)









| Length 360 mm | Rated Voltage AC 12 kV | Class General-Purpose / Back-up |
|-------------------------|------------------------|----------------------------------|
| | | |

| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Power Loss [W] | Class | Pre-arcing I²t-value [A²s] | Total l²t-value [A²s] | |
|-------------------------|---------------|-----------------------------------|----------------------|-----------------|----------------------------------|-----------------------------|--|
| 8 | 30 310 91.8 | 63 | 8 | General-purpose | 172 | 1 800 | |
| 12 | 30 310 91.12 | 63 | 13 | General-purpose | 340 | 3 800 | |
| 16 | 30 310 91.16 | 63 | 16.5 | General-purpose | 830 | 9 200 | |
| 20 | 30 310 91.20 | 63 | 20 | General-purpose | 1 730 | 17 300 | |
| 22 | 30 310 91.22 | 63 | 12 | General-purpose | 2 260 | 22 600 | |
| 40 | 30 310 91.40 | 63 | 35 | General-purpose | 3 530 | 35 500 | |
| 50 | 30 310 91.50 | 63 | 46 | General-purpose | 5 490 | 55 000 | |
| 63 | 30 310 91.63 | 63 | 62 | General-purpose | 9 030 | 90 000 | |
| 80 | 30 310 11.80 | 63 | 91 | Back-up | 17 500 | 175 000 | |
| 100 | 30 310 11.100 | 63 | 115 | Back-up | 41 500 | 415 000 | |
| 125 | 30 310 11.125 | 63 | 176 | Back-up | 56 500 | 565 000 | |

| Length 360 r | nm | Rated Voltage AC 17.5 kV | Cla G (| ss eneral-Purpose |) | | |
|-------------------------|--------------|-----------------------------|----------------------|----------------------|----------------------------------|-----------------------------|--|
| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Power Loss [W] | Class | Pre-arcing l²t-value [A²s] | Total l²t-value [A²s] | |
| 8 | 30 311 91.8 | 63 | 10 | General-purpose | 172 | 1 800 | |
| 10 | 30 311 91.10 | 63 | 15 | General-purpose | 250 | 2 800 | |
| 12 | 30 311 91.12 | 63 | 17 | General-purpose | 460 | 5 100 | |
| 16 | 30 311 91.16 | 63 | 22 | General-purpose | 1 100 | 12 000 | |
| 20 | 30 311 91.20 | 63 | 27 | General-purpose | 1 700 | 18 500 | |

Time-current characteristics and cut-off current diagram please refer to pages HHO 7 and HHO 8



Length Rated Voltage Class

360 mm AC 24 kV General-Purpose / Back-up

| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Power Loss [W] | Class | Pre-arcing I²t-value [A²s] | Total I²t-value [A²s] | |
|-------------------------|----------------|-----------------------------------|----------------------|-----------------|----------------------------------|-----------------------------|--|
| 8 | 30 312 91.8 | 63 | 17 | General-purpose | 172 | 1 900 | |
| 10 | 30 312 91.10 | 63 | 21 | General-purpose | 250 | 2 800 | |
| 12 | 30 312 91.12 | 63 | 24 | General-purpose | 460 | 5 100 | |
| 16 | 30 312 91.16 | 63 | 31 | General-purpose | 830 | 8 300 | |
| 20 | 30 312 91.20 | 63 | 21 | General-purpose | 1 730 | 17 300 | |
| 31.5 | 30 312 11.31.5 | 63 | 76 | Back-up | 1 400 | 14 000 | |
| 40 | 30 312 11.40 | 63 | 94 | Back-up | 2 200 | 22 000 | |
| 50 | 30 312 11.50 | 63 | 108 | Back-up | 4 700 | 47 000 | |
| 63 | 30 312 11.63 | 63 | 114 | Back-up | 8 700 | 87 000 | |
| 80 | 30 312 11.80 | 63 | 176 | Back-up | 13 500 | 135 000 | |

| Rated Current [A] | Part No. | Rated Breaking Current [kA] | Power Loss [W] | Class | Pre-arcing l²t-value [A²s] | Total I²t-value [A²s] | |
|-------------------------|----------------|-----------------------------------|----------------------|---------|----------------------------------|-----------------------------|--|
| 10 | 30 323 11.10 | 40 | 85 | Back-up | 70 | 1 100 | |
| 16 | 30 323 11.16 | 40 | 50 | Back-up | 160 | 1 900 | |
| 20 | 30 323 11.20 | 40 | 73 | Back-up | 550 | 6 600 | |
| 25 | 30 323 11.25 | 40 | 88 | Back-up | 920 | 11 000 | |
| 31.5 | 30 324 11.31.5 | 40 | 132 | Back-up | 1 400 | 16 800 | |
| 40 | 30 324 11.40 | 40 | 152 | Back-up | 2 640 | 31 700 | |

TIME/CURRENT CHARACTERISTICS AND CUT-OFF CURRENT DIAGRAM PLEASE REFER TO PAGES HHO 7 AND HHO 8

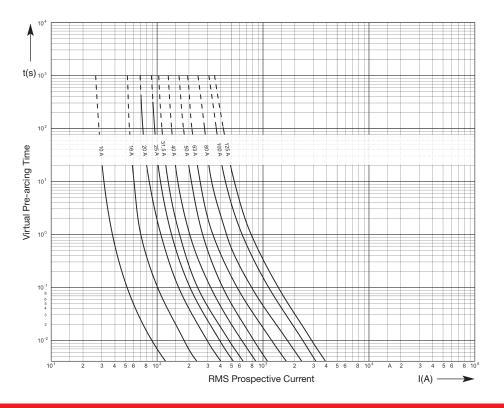
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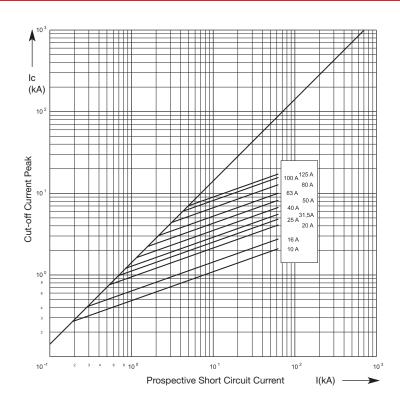
Time-Current Characteristics

Back-up



Cut-Off Current Diagram

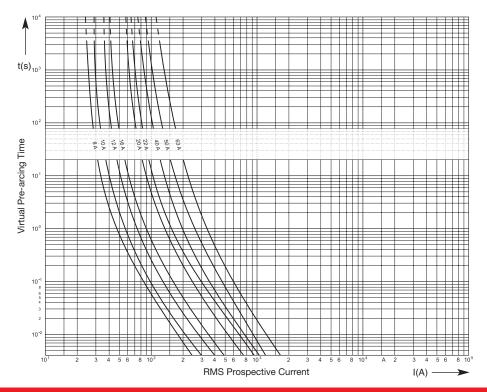
Back-up





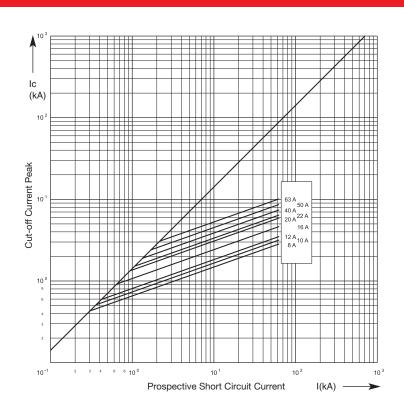
Time-Current Characteristics

General-Purpose



Cut-Off Current Diagram

General-Purpose







Recommendation for Protection of Main Transformer

| Rated Voltage [kV] | Transformer Rated Capacitiy [kVA] 50 100 160 200 250 315 400 500 630 800 1000 | | | | | | | | | | |
|-----------------------|---|----|----|----|----|----|----|------|----|-----|----|
| 12 | 8 | 12 | 16 | 20 | 22 | 40 | 50 | 63 | 80 | 100 | - |
| 24 | 8 | 8 | 10 | 12 | 16 | 20 | 20 | 31.5 | 40 | 63 | 80 |
| 36 | - | - | 10 | 16 | 16 | 20 | 20 | - | - | - | - |





HHO 10