

High-voltage fuse-links

General information on current-limiting fuse-links

The high-voltage back-up current-limiting fuse-links are designed for protection of systems which include transformers, against the destructive results of short-circuits and overloads, by limiting the thermal and electro-dynamic effects of the short-circuit currents.

The CNC fuse-links are complying with the industry standards - IEC 60282-1, DIN 43625 and IEC 60787 - and can be used both in outdoor and indoor applications.

The main characteristics of the CNC fuse-links

- High breaking capacity – 50 kA
- Limitation of the short-circuit currents at low levels
- Low power dissipation – more energy savings and less heating
- Reliable interruption of the critical currents
- Minimum breaking current is relatively low $< 4 \times I_n$
- Low switching voltage – lower than 60 kV
- Low level of the cut-off current
- Unlimited lifetime
- Same design for both indoor and outdoor usage
- Reliable proofing against humidity penetration of the fuse-link interior
- Highly qualitative raw materials and components.



Construction

The melting elements, having variable sections, are precisely wound on a ceramic carrier, ending with copper terminal parts. Inside the cylindrical cavity of the carrier is a helical wire with the role of activating the striking system. The striker (thermal or no) is used to indicate the blown of the fuse-link and it also can activate other systems. There are also models without striker.

The carrier system is introduced in a ceramic tube, sealed at ends with protective caps of nickel-plated copper, which are also acting as contacts when mounting in the basement. The inside space of the tube is filled with material for extinguishing electrical arcs, made of quartz sand with tight-controlled purity and granularity. Inside the fuse-link tube all the contacts are made through spot welding.

The copper caps are mechanically attached to the ends of the tube and proofed against humidity penetration through the use of O-shaped seals of high-temperature resistant rubber.

The caps, which are the contact parts of the fuse-link, are of two types, according to specifications of DIN 43625 and IEC 60282-1:

- Diameter of 45 mm (series: FA, FPA, FMA, FMPA) / Initial name: EA, EPA, EMA, EMPA
- Diameter of 56 mm (series: FB, FPB, FMB, FMPB) / Initial name: EB, EPB, EMB, EMPB

Operating

When the current is between the minimal breaking and the nominal breaking values the fuse element melts and evaporates, appearing the electrical arc. The arc is cooled and extinguished by the extinguishing element of the fuse-link, thus ensuring the protection of the main circuit against damages.

CNC HV fuse-links are available with striker pin of force 80 N.

The striker pin system is connected by means of a high resistance parallel conductor. After melting the main fuse elements, the striker pin indicates the operating status of the fuse and can actuate a microswitch for remote indication and/or can trigger a load break switch or a circuit breaker to open.

The fuses can be manufactured with a thermal striker that has the following functions:

- indication and switching function in case the fuse operates
- protection of the fuse enclosure of SF6-switchgear against inadmissible temperature rise.

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SF6-insulated switchgear requires additional protection features against inadmissible temperatures of certain switchgear parts.

The thermal striker avoids unacceptably high temperatures in gas-insulated switchgear. By means of a melting activator, temperatures inside the fuse-link enclosure are limited. This design especially considers continuity of current supply for the user for as long as possible. When inadmissible values are exceeded, the fuse will open the switch via the striker pin.

CNC fuses have especially designed to be used with SF6 switchgear due to our design of fuse end caps which have a perfectly smooth surfaces.

Our fuses have been specifically designed to work in switch-fuse combination and have a design that ensure lower power dissipation.

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Product Code	Rated Voltage	Rated Current	Rated Breaking Capacity	Minim Breaking Current	Power Dissipation	Cold Resistance	Length	Pre-Arcing I _t	Total I _t	Tube diameter	Weight
	Un (kV)	In (A)	I ₁ (kA)	I ₃ (A)	(W)	(mΩ)	(mm)	(A ² s)	(A ² s)	(mm)	(kg)
E(P)A/B-7,2-2,5	3/7,2	2,5	50	8	4,5	880	192	10	71	53	1,1
E(P)A/B-7,2-4	3/7,2	4	50	15	7,2	421	192	27	200	53	1,1
E(P)A/B-7,2-6,3	3/7,2	6,3	50	24	9,4	187	192	53	420	53	1,1
E(P)A/B-7,2-10	3/7,2	10	50	39	18,7	124	192	257	1920	53	1,1
E(P)A/B-7,2-16	3/7,2	16	50	63	20,9	52	192	339	2950	53	1,1
E(P)A/B-7,2-20	3/7,2	20	50	76	20,2	26	192	827	6200	53	1,1
E(P)A/B-7,2-25	3/7,2	25	50	98	21	24	192	963	6880	53	1,1
E(P)A/B-7,2-31,5	3/7,2	31,5	50	125	24,6	17,3	192	1785	12600	53	1,1
E(P)A/B-7,2-40	3/7,2	40	50	150	32	13,8	192	3449	22600	53	1,1
EM(P)A/B-7,2-50	3/7,2	50	50	190	39,7	9,7	192	6759	39130	75	1,4
EM(P)A/B-7,2-63	3/7,2	63	50	243	40,9	5,4	192	11105	68500	75	1,4
EM(P)A/B-7,2-80	3/7,2	80	50	316	45	4	192	22800	152000	75	1,4
EM(P)A/B-7,2-100	3/7,2	120	50	395	65	3,8	192	28878	263000	85	2,4
EM(P)A/B-7,2-125	3/7,2	125	50	595	82	3,3	192	48253	308000	85	2,4
F(P)A/B-12-2,5	6/12	2,5	50	8	8	1443	292	10	71	53	1,6
F(P)A/B-12-4	6/12	4	50	15	11,4	715	292	27	200	53	1,6
F(P)A/B-12-6,3	6/12	6,3	50	24	16,9	315	292	53	420	53	1,6
F(P)A/B-12-10	6/12	10	50	39	30,9	210	292	257	1920	53	1,6
F(P)A/B-12-16	6/12	16	50	63	34,1	90	292	339	2950	53	1,6
F(P)A/B-12-20	6/12	20	50	76	25	55,6	292	827	6200	53	1,6
F(P)A/B-12-25	6/12	25	50	98	33	45	292	963	6880	53	1,6
F(P)A/B-12-31,5	6/12	31,5	50	125	41	35,8	292	1785	12600	53	1,6
F(P)A/B-12-40	6/12	40	50	150	58	28	292	3449	22600	53	1,6
FM(P)A/B-12-50	6/12	50	50	190	53	16,9	292	6759	39130	75	2,1
FM(P)A/B-12-63	6/12	63	50	243	59	11,2	292	11105	68500	75	2,1
FM(P)A/B-12-80	6/12	80	50	316	80	9,4	292	22800	152000	75	2,1
FM(P)A/B-12-100	6/12	100	50	395	109	7,2	292	28878	263000	85	3,7
FM(P)A/B-12-125	6/12	125	50	595	151	6,1	292	48253	308000	85	3,7

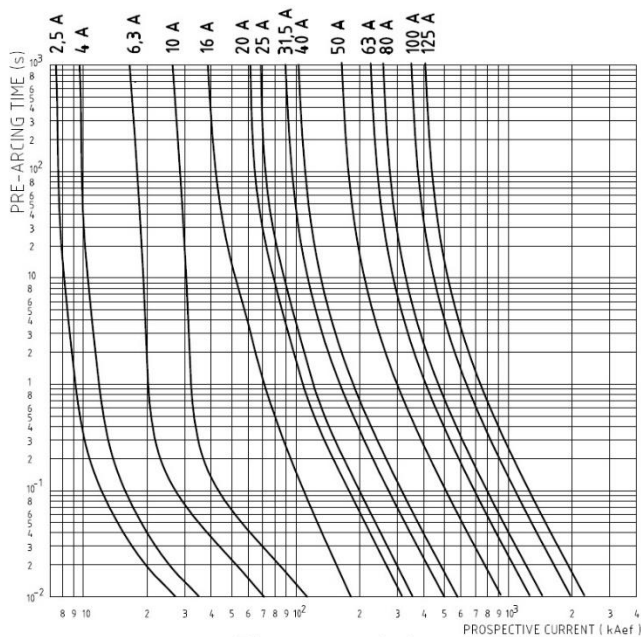
High-voltage fuse-links

Technical data

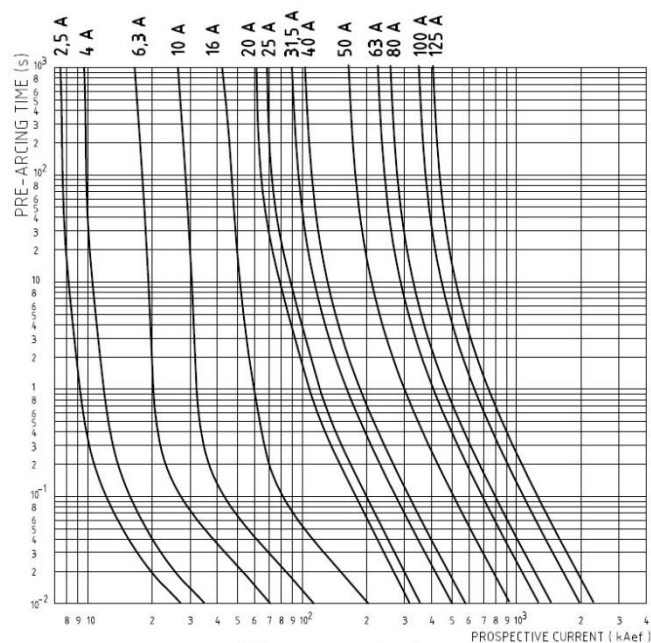
Product Code	Rated Voltage	Rated Current	Rated Breaking Capacity	Minim Breaking Current	Power Dissipation	Cold Resistance	Length	Pre-Arcing I^2t	Total I^2t	Tube diameter	Weight
	Un (kV)	In (A)	I1 (kA)	I3 (A)	(W)	(mΩ)	(mm)	(A²s)	(A²s)	(mm)	(kg)
F(P)A/B-24-2,5	10/24	2,5	50	8	18	2680	442	10	71	53	2,5
F(P)A/B-24-4	10/24	4	50	15	27	1430	442	27	200	53	2,5
F(P)A/B-24-6,3	10/24	6,3	50	24	29	613	442	53	420	53	2,5
F(P)A/B-24-10	10/24	10	50	39	63	414	442	257	1920	53	2,5
F(P)A/B-24-16	10/24	16	50	63	51	154	442	339	2950	53	2,5
F(P)A/B-24-20	10/24	20	50	76	54	103	442	827	6200	53	2,5
F(P)A/B-24-25	10/24	25	50	98	70	83	442	963	6880	53	2,5
F(P)A/B-24-31,5	10/24	31,5	50	125	91	66	442	1785	12600	53	2,5
F(P)A/B-24-40	10/24	40	50	150	128	51	442	3449	22600	53	2,5
FM(P)A/B-24-50	10/24	50	50	190	123	31	442	6759	39130	75	4,6
FM(P)A/B-24-63	10/24	63	50	243	131	21	442	11105	68500	75	4,6
FM(P)A/B-24-80	10/24	80	50	316	178	17	442	22800	152000	75	4,6
FM(P)A/B-24-100	10/24	100	50	395	240	13	442	28878	263000	85	5,7
FM(P)A/B-24-125	10/24	125	50	595	318	11	442	48253	308000	85	5,7
E(P)A/B-36-2,5	20/36	2,5	20	8	22	4413	537	10	71	53	3,7
E(P)A/B-36-4	20/36	4	20	15	47	2199	537	27	200	53	3,7
E(P)A/B-36-6,3	20/36	6,3	20	25	52	1029	537	53	420	53	3,7
E(P)A/B-36-10	20/36	10	20	40	68	656	537	257	1920	53	3,7
E(P)A/B-36-16	20/36	16	20	82	84	198	537	480	2840	53	3,7
E(P)A/B-36-20	20/36	20	20	95	99	172	537	520	3460	53	3,7
E(P)A/B-36-25	20/36	25	20	110	111	116	537	963	6880	53	3,7
E(P)A/B-36-31,5	20/36	31,5	20	135	119	87	537	1785	12630	53	3,7
E(P)A/B-36-40	20/36	40	20	180	140	69	537	3449	22620	53	3,7

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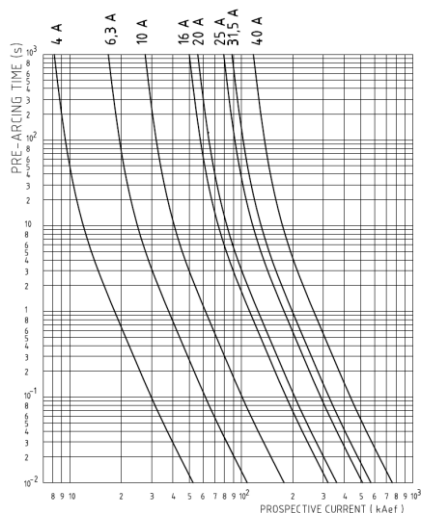
Time-current characteristic and cut-off current diagram



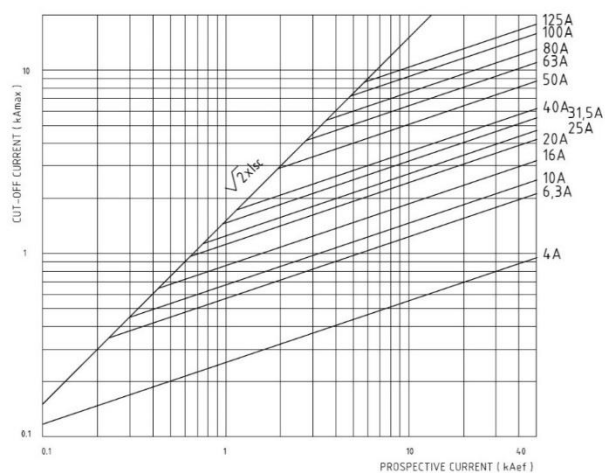
Time-current characteristic 7,2 kV and 24 kV



Time-current characteristic 12 kV



Time-current characteristic 36 kV

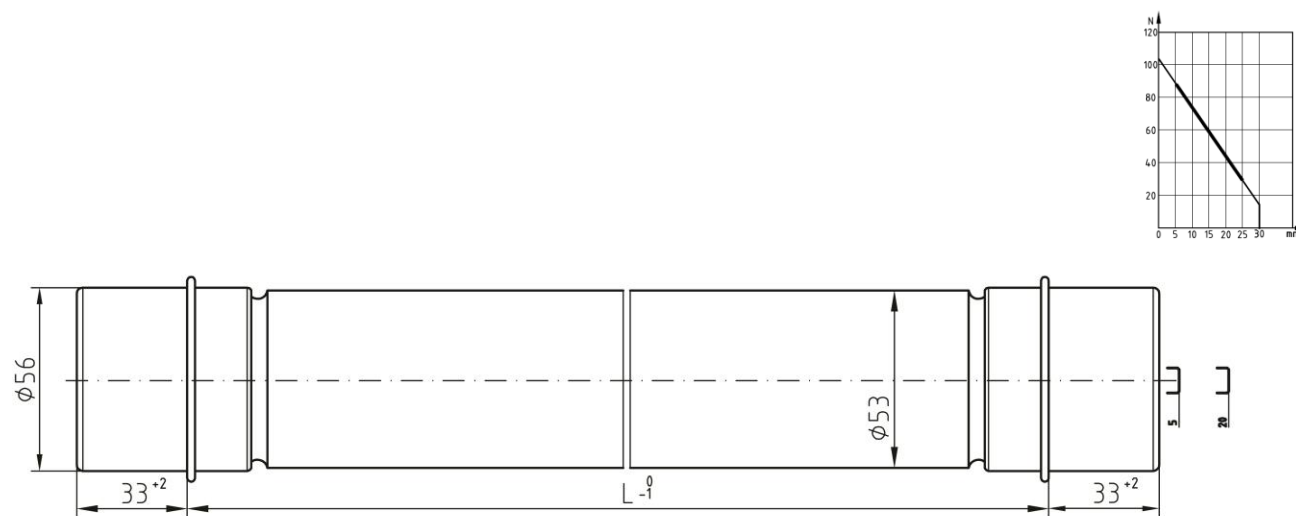
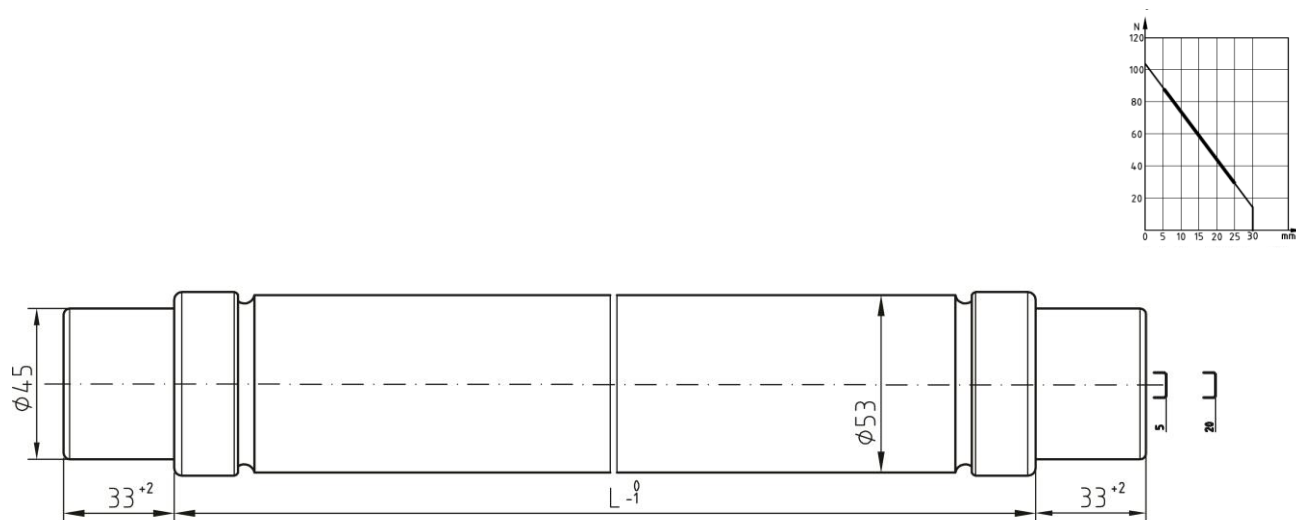


Cut-off characteristic

The time-current specifications are for a temperature of 15-20 °C of the surrounding environment. If the fuse-link is to be used in closed environments with other sources of heat, the user should contact the manufacturer for choosing the right models of fuse-link.

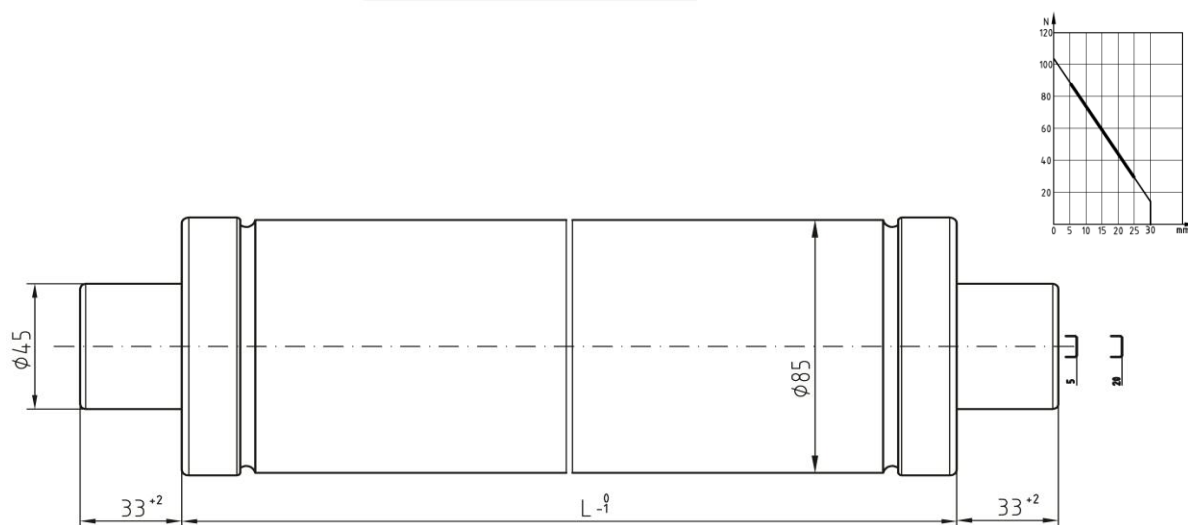
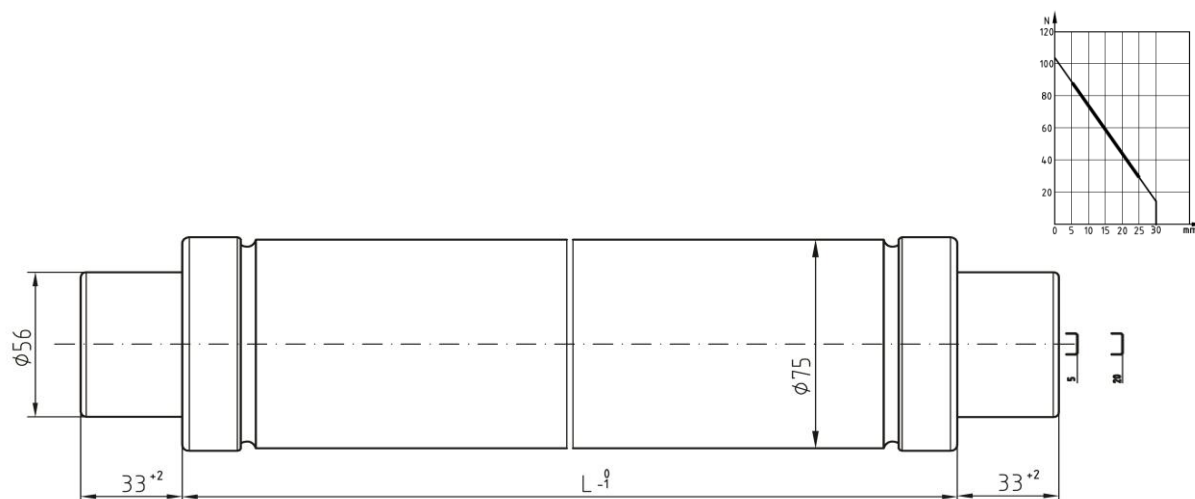
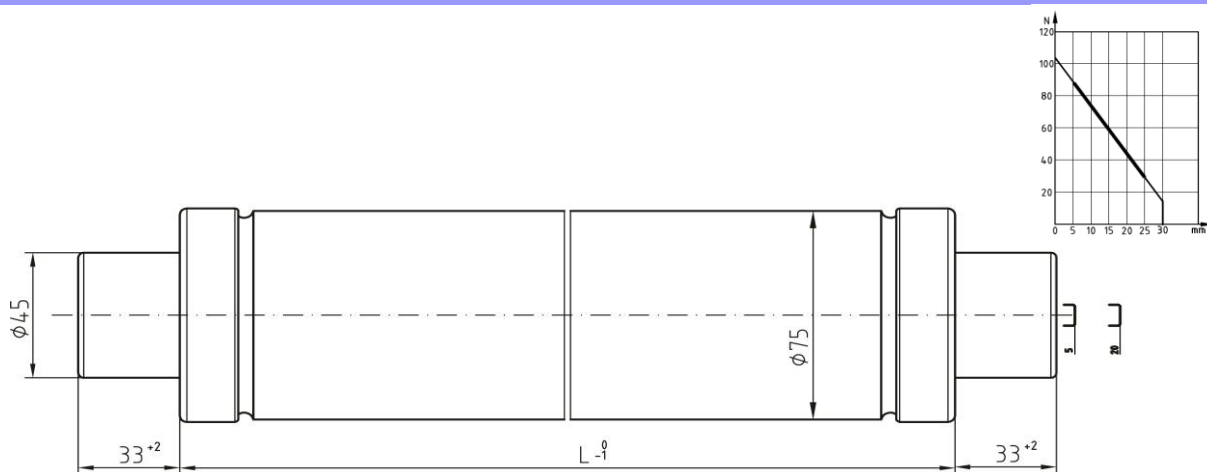
High-voltage fuse-links

Dimensions – FPA, FPB, EPA, EPB



High-voltage fuse-links

Dimensions – FMFA, FMPB



High-voltage fuse-links

How to select the fuse-link model

According to the specifications of IEC 787 it is recommended the usage of the following fuse-links depending on the rated power of the transformers to be protected.

<i>Un</i> (KV)	<i>Pn</i> (KVA)	<i>In Primary</i> (A)	<i>Short-circuit Voltage</i> (%)	<i>Connection Group</i>	<i>Rate Current of the Fuse-link</i>	
					<i>In (min)</i> (A)	<i>In (max)</i> (A)
20	25	0,72	4	Yzn-5	4	4
20	40	1,15	4	Yzn-5	4	6,3
20	63	1,81	4	Yzn-5	6,3	10
20	100	2,88	4	Yzn-5	10	16
20	160	4,61	4	Yzn-5	16	16
20	250	7,21	6	Dyn-5	16	16
20	400	11,5	6	Dyn-5	25	25
20	630	18,18	6	Dyn-5	31,5	50
20	1000	28,8	6	Dyn-5	50	63
20	1600	46,1	6	Dyn-5	63	80
10	25	1,44	4	Yzn-5	6,3	10
10	40	2,31	4	Yzn-5	10	10
10	63	3,63	4	Yzn-5	10	16
10	100	5,76	4	Yzn-5	16	25
10	160	9,23	4	Yzn-5	25	31,5
10	250	14,43	6	Dyn-5	31,5	40
10	400	23,11	6	Dyn-5	40	50
10	630	36,37	6	Dyn-5	50	63
10	1000	57,6	6	Dyn-5	80	100
10	1600	92	6	Dyn-5	125	125
6	25	2,4	4	Yzn-5	6,3	10
6	40	3,85	4	Yzn-5	10	16
6	63	6,06	4	Yzn-5	16	16
6	100	9,62	4	Yzn-5	25	31,5
6	160	15,39	4	Yzn-5	31,5	40
6	250	24,05	6	Dyn-5	40	50
6	400	38,5	6	Dyn-5	50	63
6	630	60,6	6	Dyn-5	63	80
6	1000	96,2	6	Dyn-5	100	125

Operation and maintenance requirements

For indoor usage the fuse-links could be mounted either horizontally or vertically. For outdoor applications the fuse-links should be mounted only vertically with the strike system downwards.

Replacement of the blown fuse-links should be done only complying to the requirements of the work safety techniques and only by personnel trained and qualified for working with high-voltage installations. The operations are forbidden if current is flowing in the circuit.

The blown fuse-links should be replaced only with new ones. In case of tri-phases circuitry, after burning one fuse-link the fuses for all phases should be replaced.

It is recommended to examine periodically the status of the protective coverings of the fuse-links' contacts.

High-voltage fuse-links

Ordering information

Un (kV)	In (A)	Diameter of Contact			
		45 mm		56 mm	
		With Striker	Without Striker	With Striker	Without Striker
24	2,5	F(E)PA-24-2,5	F(E)A-24-2,5	F(E)PB-24-2,5	F(E)B-24-2,5
24	4	F(E)PA-24-4	F(E)A-24-4	F(E)PB-24-4	F(E)B-24-4
24	6,3	F(E)PA-24-6,3	F(E)A-24-6,3	F(E)PB-24-6,3	F(E)B-24-6,3
24	10	F(E)PA-24-10	F(E)A-24-10	F(E)PB-24-10	F(E)B-24-10
24	16	F(E)PA-24-16	F(E)A-24-16	F(E)PB-24-16	F(E)B-24-16
24	20	F(E)PA-24-20	F(E)A-24-20	F(E)PB-24-20	F(E)B-24-20
24	25	F(E)PA-24-25	F(E)A-24-25	F(E)PB-24-25	F(E)B-24-25
24	31,5	F(E)PA-24-31,5	F(E)A-24-31,5	F(E)PB-24-31,5	F(E)B-24-31,5
24	40	F(E)PA-24-40	F(E)A-24-40	F(E)PB-24-40	F(E)B-24-40
24	50	F(E)MPA-24-50	F(E)MA-24-50	F(E)MPB-24-50	F(E)MB-24-50
24	63	F(E)MPA-24-63	F(E)MA-24-63	F(E)MPB-24-63	F(E)MB-24-63
24	80	F(E)MPA-24-80	F(E)MA-24-80	F(E)MPB-24-80	F(E)MB-24-80
24	100	F(E)MPA-24-100	F(E)MA-24-100	F(E)MPB-24-100	F(E)MB-24-100
24	125	F(E)MPA-24-125	F(E)MA-24-125	F(E)MPB-24-125	F(E)MB-24-125
12	2,5	F(E)PA-12-2,5	F(E)A-12-2,5	F(E)PB-12-2,5	F(E)B-12-2,5
12	4	F(E)PA-12-4	F(E)A-12-4	F(E)PB-12-4	F(E)B-12-4
12	6,3	F(E)PA-12-6,3	F(E)A-12-6,3	F(E)PB-12-6,3	F(E)B-12-6,3
12	10	F(E)PA-12-10	F(E)A-12-10	F(E)PB-12-10	F(E)B-12-10
12	16	F(E)PA-12-16	F(E)A-12-16	F(E)PB-12-16	F(E)B-12-16
12	20	F(E)PA-12-20	F(E)A-12-20	F(E)PB-12-20	F(E)B-12-20
12	25	F(E)PA-12-25	F(E)A-12-25	F(E)PB-12-25	F(E)B-12-25
12	31,5	F(E)PA-12-31,5	F(E)A-12-31,5	F(E)PB-12-31,5	F(E)B-12-31,5
12	40	F(E)PA-12-40	F(E)A-12-40	F(E)PB-12-40	F(E)B-12-40
12	50	F(E)MPA-12-50	F(E)MA-12-50	F(E)MPB-12-50	F(E)MB-12-50
12	63	F(E)MPA-12-63	F(E)MA-12-63	F(E)MPB-12-63	F(E)MB-12-63
12	80	F(E)MPA-12-80	F(E)MA-12-80	F(E)MPB-12-80	F(E)MB-12-80
12	100	F(E)MPA-12-100	F(E)MA-12-100	F(E)MPB-12-100	F(E)MB-12-100
12	125	F(E)MPA-12-125	F(E)MA-12-125	F(E)MPB-12-125	F(E)MB-12-125
7,2	2,5	F(E)PA-7,2-2,5	F(E)A-7,2-2,5	F(E)PB-7,2-2,5	F(E)B-7,2-2,5
7,2	4	F(E)PA-7,2-4	F(E)A-7,2-4	F(E)PB-7,2-4	F(E)B-7,2-4
7,2	6,3	F(E)PA-7,2-6,3	F(E)A-7,2-6,3	F(E)PB-7,2-6,3	F(E)B-7,2-6,3
7,2	10	F(E)PA-7,2-10	F(E)A-7,2-10	F(E)PB-7,2-10	F(E)B-7,2-10
7,2	16	F(E)PA-7,2-16	F(E)A-7,2-16	F(E)PB-7,2-16	F(E)B-7,2-16
7,2	20	F(E)PA-7,2-20	F(E)A-7,2-20	F(E)PB-7,2-20	F(E)B-7,2-20
7,2	25	F(E)PA-7,2-25	F(E)A-7,2-25	F(E)PB-7,2-25	F(E)B-7,2-25
7,2	31,5	F(E)PA-7,2-31,5	F(E)A-7,2-31,5	F(E)PB-7,2-31,5	F(E)B-7,2-31,5
7,2	40	F(E)PA-7,2-40	F(E)A-7,2-40	F(E)PB-7,2-40	F(E)B-7,2-40
7,2	50	F(E)MPA-7,2-50	F(E)MA-7,2-50	F(E)MPB-7,2-50	F(E)MB-7,2-50
7,2	63	F(E)MPA-7,2-63	F(E)MA-7,2-63	F(E)MPB-7,2-63	F(E)MB-7,2-63
7,2	80	F(E)MPA-7,2-80	F(E)MA-7,2-80	F(E)MPB-7,2-80	F(E)MB-7,2-80
7,2	100	F(E)MPA-7,2-100	F(E)MA-7,2-100	F(E)MPB-7,2-100	F(E)MB-7,2-100
7,2	125	F(E)MPA-7,2-125	F(E)MA-7,2-125	F(E)MPB-7,2-125	F(E)MB-7,2-125
36	2,5	EPA-36-2,5	EA-36-2,5	EPB-36-2,5	EB-36-2,5
36	4	EPA-36-4	EA-36-4	EPB-36-4	EB-36-4
36	6,3	EPA-36-6,3	EA-36-6,3	EPB-36-6,3	EB-36-6,3
36	10	EPA-36-10	EA-36-10	EPB-36-10	EB-36-10
36	16	EPA-36-16	EA-36-16	EPB-36-16	EB-36-16
36	20	EPA-36-20	EA-36-20	EPB-36-20	EB-36-20
36	25	EPA-36-25	EA-36-25	EPB-36-25	EB-36-25
36	31,5	EPA-36-31,5	EA-36-31,5	EPB-36-31,5	EB-36-31,5
36	40	EPA-36-40	EA-36-40	EPB-36-40	EB-36-40

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