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DRIESCHER
High-voltage high breaking capacity fuses

• 6 kV up to 36 kV

DRIESCHER
Moosburg • Eisleben

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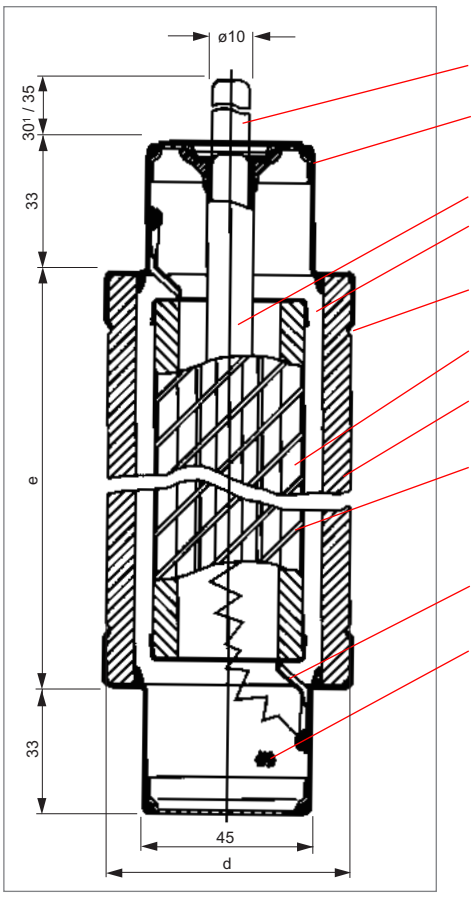
Dimensions



Rated voltage *in kV*	***e*** *in mm*
6 / 12	***292***
10 / 24	***442***
20 / 36	***537***

Pic.: 1

1) *Type EMPA*

General description

DRIESCHER h.v.h.b.c. fuses are automatic and selectively acting medium-voltage switchgears for the voltage range from 6 to 36 kV. With their extremely fast short-circuit interruption they reliably protect transformers, cables, capacitors and switching installations against the thermal and dynamic effects of short circuits.

DRIESCHER h.v.h.b.c. fuses are designed for installation

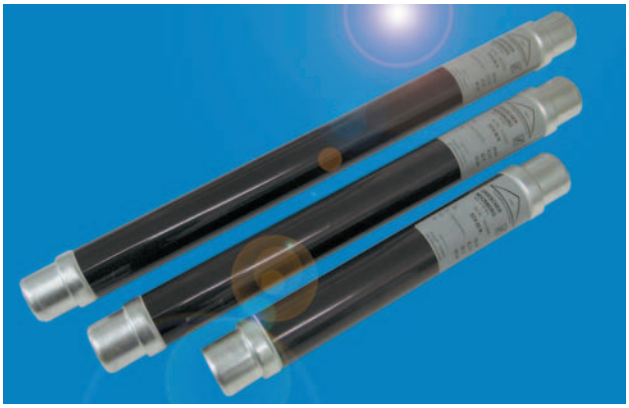
- *in air and gas-insulated switches*
- *in outdoor switches*
- *in troublesome climates*

Their dimensions are in compliance with the DIN 43625 and meet the requirements of
IEC 60282-1,
IEC 60644,
IEC 60549.

Types

DRIESCHER h.v.h.b.c. fuses are back-up fuses which can interrupt all currents from the rated breaking current I_1 down to their smallest breaking current I_3.All types of our h.v.h.b.c. fuses are made with porcelain tubes which are glazed brown for use indoors and outdoors.
The contact faces of the ferrules are of the same diameter irrespective of type, rated current and rated voltage.
All h.v.h.b.c. fuses with a striker impact force of 80 N are provided with integrated thermal protection as standard.H.v.h.b.c. fuses are also available with a release force of 120 N, but without thermal protection.

Rated voltage U_R [kV]	Release force [N]	Part No:
12	**120**	*796 15... (according to A)*
24	**120**	*796 25... (according to A)*
36	**120**	*796 35... (according to A)*



Design

The parallel connected fuse elements of the DRIESCHER h.v.h.b.c. fuses are made of pure silver.
The fuse element design and manufacturing method of the reduced cross section areas ensure a close characteristic tolerance. These fuse elements are wound on a star-shaped ceramic support and are welded at the end by resistance welding at the silver plated ferrules.

The copper ferrules are pressed onto the porcelain tube, i.e. they are mechanically connected to the porcelain tube and are additionally provided with a permanent elastic sealing.

The striker pin

The energy storage mechanisms installed in the h.v.h.b.c. fuses operate immediately when the fuse element melts or by activate of the thermal protection. The striker pin, which is available with a release force of 80 or 120 N, mechanically operates the breaker mechanism of a load-break switch or operates a special device for remote indication.

H.v.h.b.c fuses with striker type STA

Release force 80 N and thermal protection up to 160 A

Rated voltage U_R [kV]	Rated current I_R [A]	e[2)] [mm]	d[2)] [mm]	Weight [kg]	Rated breaking current I_1 [kA]	Minimum breaking current I_3 [A]	Power loss P_v [W]	Part No.
6 / 12	**2**	292	53	1,6	63	16	8,5	797 10002
6 / 12	**4**	292	53	1,6	63	32	11,2	797 10004
6 / 12	**6,3**	292	53	1,6	63	22	16	797 10006
6 / 12	**10**	292	53	1,6	63	34	28	797 10010
6 / 12	**16**	292	53	1,6	63	56	28	797 10016
6 / 12	**20**	292	53	1,6	63	70	23	797 10020
6 / 12	**25**	292	53	1,6	63	90	29	797 10025
6 / 12	**31,5**	292	53	1,6	63	110	38	797 10030
6 / 12	**40**	292	53	1,6	63	140	50	797 10040
6 / 12	**50**	292	53	1,6	63	170	56	797 10050
6 / 12	**63**	292	67	2,0	63	210	63	797 10063
6 / 12	**80**	292	67	2,0	63	280	76	797 10080
6 / 12	**100**	292	67	2,0	63	320	104	797 10100
6 / 12	**125**	292	67	2,0	63	390	159	797 10125
6 / 12	**160**RC125[3)]	292	85	3,8	63	600	96	797 10160
10 / 24	**2**	442	53	2,2	63	16	15	797 20002
10 / 24	**4**	442	53	2,2	63	32	22	797 20004
10 / 24	**6,3**	442	53	2,2	63	22	29	797 20006
10 / 24	**10**	442	53	2,2	63	34	52	797 20010
10 / 24	**16**	442	53	2,2	63	56	59	797 20016
10 / 24	**20**	442	53	2,2	63	70	46	797 20020
10 / 24	**25**	442	53	2,2	63	90	56	797 20025
10 / 24	**31,5**	442	53	2,2	63	110	72	797 20030
10 / 24	**40**	442	53	2,2	63	140	106	797 20040
10 / 24	**50**	442	67	2,9	63	170	108	797 20050
10 / 24	**63**	442	67	2,9	63	210	132	797 20063
10 / 24	**80**	442	67	2,9	63	280	174	797 20080
10 / 24	**100**	442	85	5,4	63	320	234	797 20100
10 / 24	**125**	442	85	5,4	63	390	320	797 20125
10 / 24	**160**RC100[3)]	442	85	5,4	63	600	146	797 20160
20 / 36	**2**	537	53	2,6	40	16	21	797 30002
20 / 36	**4**	537	53	2,6	40	32	35	797 30004
20 / 36	**6,3**	537	53	2,6	40	22	44	797 30006
20 / 36	**10**	537	53	2,6	40	34	78	797 30010
20 / 36	**16**	537	53	2,6	40	56	101	797 30016
20 / 36	**20**	537	53	2,6	40	70	66	797 30020
20 / 36	**25**	537	53	2,6	40	90	90	797 30025
20 / 36	**31,5**	537	67	3,5	40	110	135	797 30030
20 / 36	**40**	537	67	3,5	40	140	173	797 30040
20 / 36	**50**	537	85	6,0	40	170	214	797 30050
20 / 36	**63**	537	85	6,0	40	210	255	797 30063
20 / 36	**80**RC63[3)]	537	85	6,0	40	280	145	797 30080
20 / 36	**100**RC71[3)]	537	85	6,0	40	350	162	797 30100

2) *see page 3, Pic.: 1*

3) *Rating I - In some fuse-links, a double designation is used to specify a current, e.g. 160RC100 A. The first value designates the time-current characteristic, such as 160A in this example. The "RC", which stands for "Rated Current", is followed by the rated current, which considers the maximum permissible warming of the fuse-link under normative conditions. In the example this is 100 A.*

H.v.h.b.c. fuses with striker type EMPA

Release force 80 N and thermal protection up to 125 A

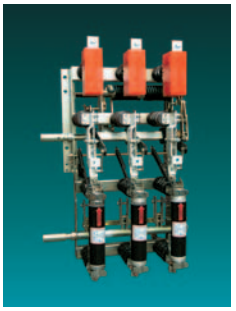
Rated voltage U_R [kV]	Rated current I_R [A]	e[2)] [mm]	d[2)] [mm]	Weight [kg]	Rated breaking current I_1 [kA]	Minimum breaking current I_3 [A]	Power loss P_v [W]	Part No.
12	**2,5**	292	53	1,6	50	8	8	798 10002
12	**4**	292	53	1,6	50	15	11,4	798 10004
12	**6,3**	292	53	1,6	50	24	16,9	798 10006
12	**10**	292	53	1,6	50	39	30,9	798 10010
12	**16**	292	53	1,6	50	63	34,1	798 10016
12	**20**	292	53	1,6	50	76	25	798 10020
12	**25**	292	53	1,6	50	98	33	798 10025
12	**31,5**	292	53	1,6	50	125	41	798 10030
12	**40**	292	53	1,6	50	150	58	798 10040
12	**50**	292	75	2,1	50	190	53	798 10050
12	**63**	292	75	2,1	50	243	59	798 10063
12	**80**	292	75	2,1	50	316	80	798 10080
12	**100**	292	85	3,7	50	395	109	798 10100
24	**2,5**	442	53	2,5	50	8	18	798 20002
24	**4**	442	53	2,5	50	15	27	798 20004
24	**6,3**	442	53	2,5	50	24	29	798 20006
24	**10**	442	53	2,5	50	39	63	798 20010
24	**16**	442	53	2,5	50	63	51	798 20016
24	**20**	442	53	2,5	50	76	54	798 20020
24	**25**	442	53	2,5	50	98	70	798 20025
24	**31,5**	442	53	2,5	50	125	91	798 20030
24	**40**	442	53	2,5	50	150	128	798 20040
24	**50**	442	75	4,6	50	190	123	798 20050
24	**63**	442	75	4,6	50	243	131	798 20063
24	**80**	442	75	4,6	50	316	178	798 20080
24	**100**	442	85	5,7	50	395	240	798 20100
24	**125**	442	85	5,7	50	595	318	798 20125

2) *see page 3, Pic.: 1*

H.v.h.b.c. fuses with striker type SSK

Release force 80 N and thermal protection up to 125 A

High-voltage high breaking capacity fuses type SSK for the protection of high power transformers with a special alignment to the rated transient current of switch-fuse combinations according to EN 62271-105.



These high-voltage high breaking capacity fuses complete the existing product range.The fuses are specially used in switches with relatively low values of switch opening timesand of the transient current which are used in front of transformers with a power of more than 630 kVA.

(Because of the favourable relation between transient current of the fuse and the rated transient current of the switch in case of lower transformer powers, standard fuses can be used).

The determination of the rated current of the fuses for the transformer protection is effected according to the recommendations of the fuse manufacturers following VDE 0670 Part 402.

The main aim was to reduce the melting times below 100 ms clearly, without influencing further fuse characteristics in a negative way. The requirements for a lower temperature rise have been successfully carried out, the output in the rated operation of the corresponding transformer is only 70 to 75 watt.
Further on, the known low value of the minimum breaking current of our standard high-voltage high breaking capacity fuses in the height of 3.5 times of the rated current was kept the same.

Advantages:

- quick time-current behaviour in the transition range of "quick" switches
- suitable for high transformer capacity
- low output
- low temperature rise

Rated voltage U_R [kV]	Rated current I_R [A]	e[2)] [mm]	d[2)] [mm]	Weight [kg]	Maximum breaking current I_1 [kA]	Minimum breaking current I_3 [A]	Power loss P_v [W]	Part No.
6 / 12	**63**	292	67	2,0	63	210	62	797 19063
6 / 12	**80**	292	67	2,0	63	280	76	797 19080
6 / 12	**100**	292	67	2,0	63	320	98	797 19100
6 / 12	**125**	292	85	3,8	63	450	135	797 19125
10 / 24	**63**	442	67	2,9	63	210	117	797 29063
10 / 24	**80**	442	67	2,9	63	280	143	797 29080
10 / 24	**100**	442	85	5,4	63	320	188	797 29100
10 / 24	**125**	442	85	5,4	63	450	277	797 29125

2) *see page 3, Pic.: 1*

Short-circuit current limitation

DRIESCHER high-voltage high breaking capacity fuses already break during the current rise in the first loop of short-circuit current.They are thus short-circuit current limiting.

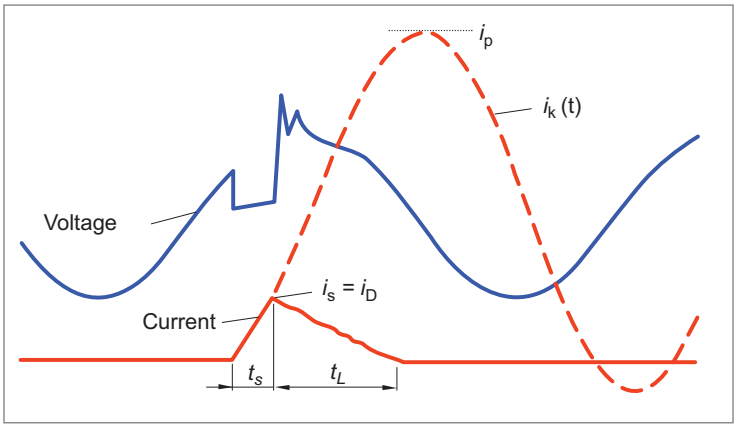
The progress of a short circuit break is shown in the figure below.

Without a fuse connected upstream the short-circuit current would behave as shown by the broken line $I_k(t)$ and reach the maximum value I_p (peak short-circuit current).
The current limiting action of the fuse, however, only permits the cut-off current i_D to rise up to the height of the melting current i_s (full line).During the arcing time t_L the current decreases with increasing arc length and is finally broken in the vicinity of the voltage zero passage. The current-limiting action of the fuses relieves equipment and system parts of thermal and dynamic stress.

It is clear that the application of current-limiting fuses is particularly advantageous in older installations which have not been designed for the increase in system short-circuit levels.

The value of the cut-off current is influenced by the design of the fuse. It also depends on the rated current (fuse element cross section), the rate of current rise and the moment in which the short circuit occurs.

i_s	Melting current
i_D	Cut-off current
$i_k(t)$	Behaviour of short circuit current when fuse is replaced by metal link
i_p	Peak short-circuit current
t_s	Pre-arcing time
t_L	Arcing time

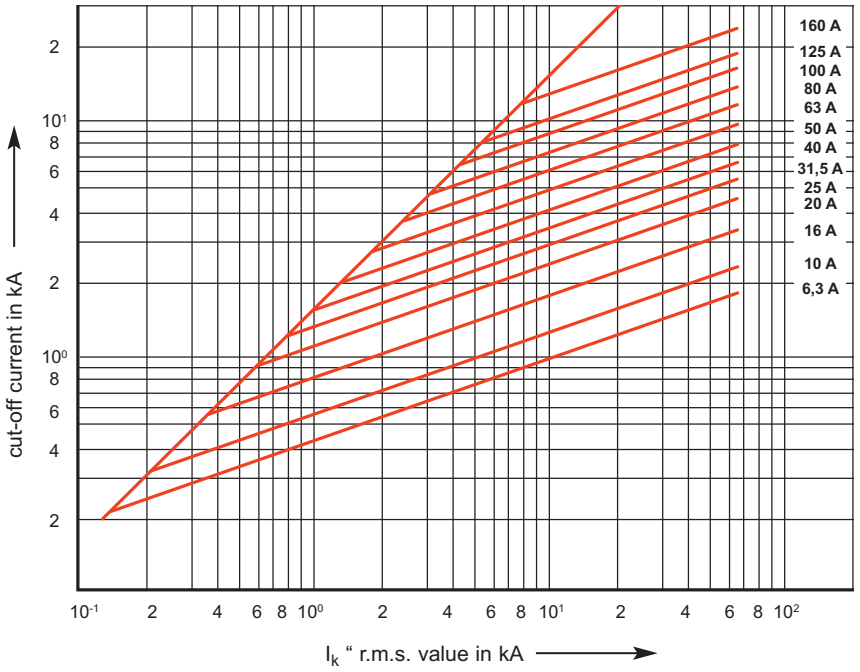


Short-circuit current limitation

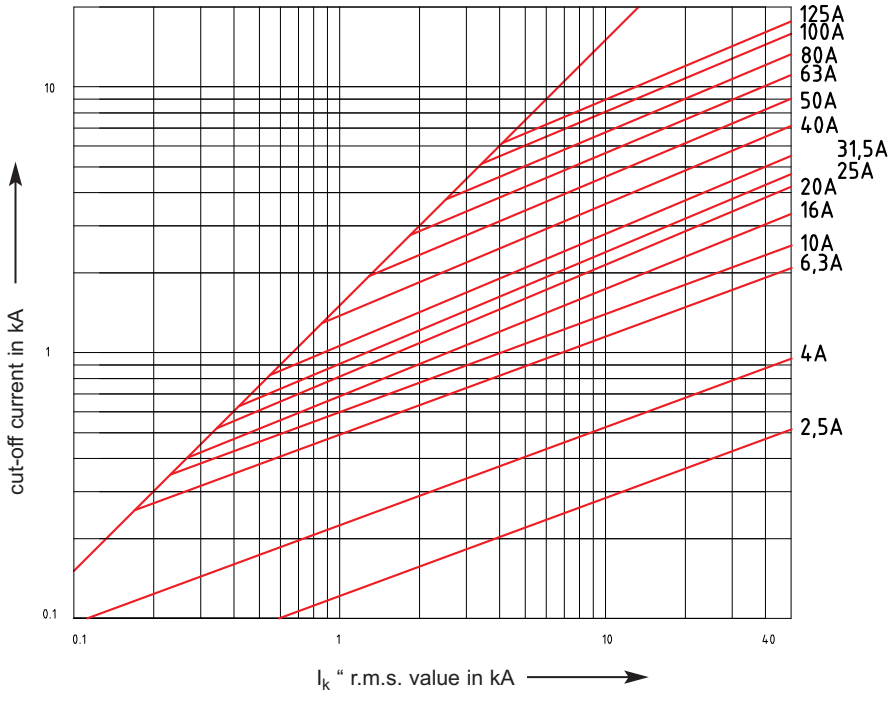
From the following diagram the cut-off current of the DRIESCHER high-voltage high breaking capacity fuses can be determined as a function of the r.m.s. value of the symmetrical component and of the rated current.

The prospective short-circuit current I_k" is expressed by the r.m.s. value of the symmetrical component of the short-circuit current $I_k(t)$ at the instant of the short circuit which would flow at the position of installation if the fuse were replaced by a link.
The cut-off currents determined give the maximum value which might occur for a given r.m.s. value of the symmetrical component of the prospective short-circuit current with highest rate of current rise. Actual values are thus, as a rule, below the values determined.

Type STA and SSK

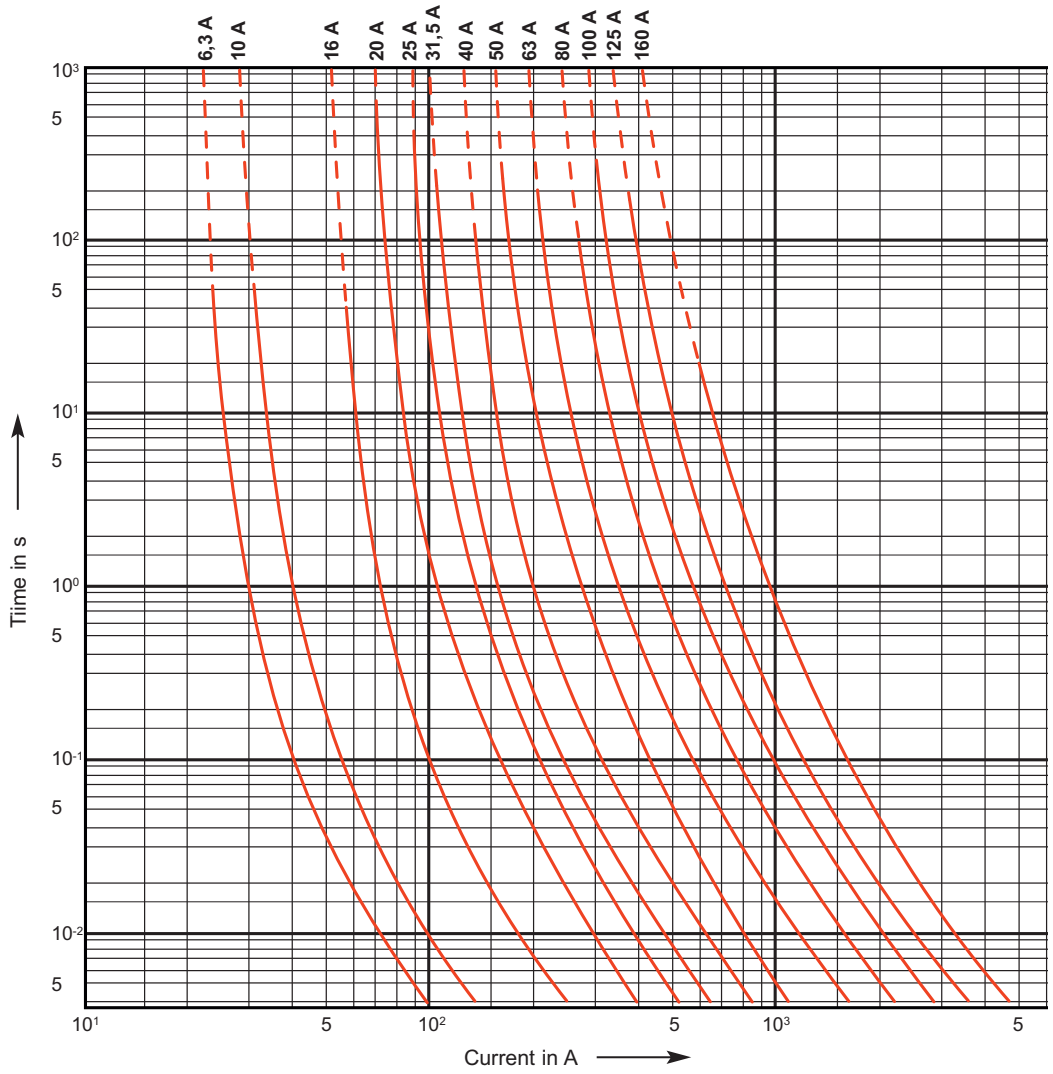


Type EMPA



Time/current characteristics for h.v.h.b.c Type STA and SSK

The diagram below shows the pre-arching time/current characteristics of DRIESCHER h.v.h.b.c fuses with rated currents from 6.3 to 160 A.
Close tolerances of the elements (tolerance 0.003 mm), stringent controls during manufacture and a conscientious electrical checking of the required values on finished fuses assure that the characteristics are being met within narrow limits.



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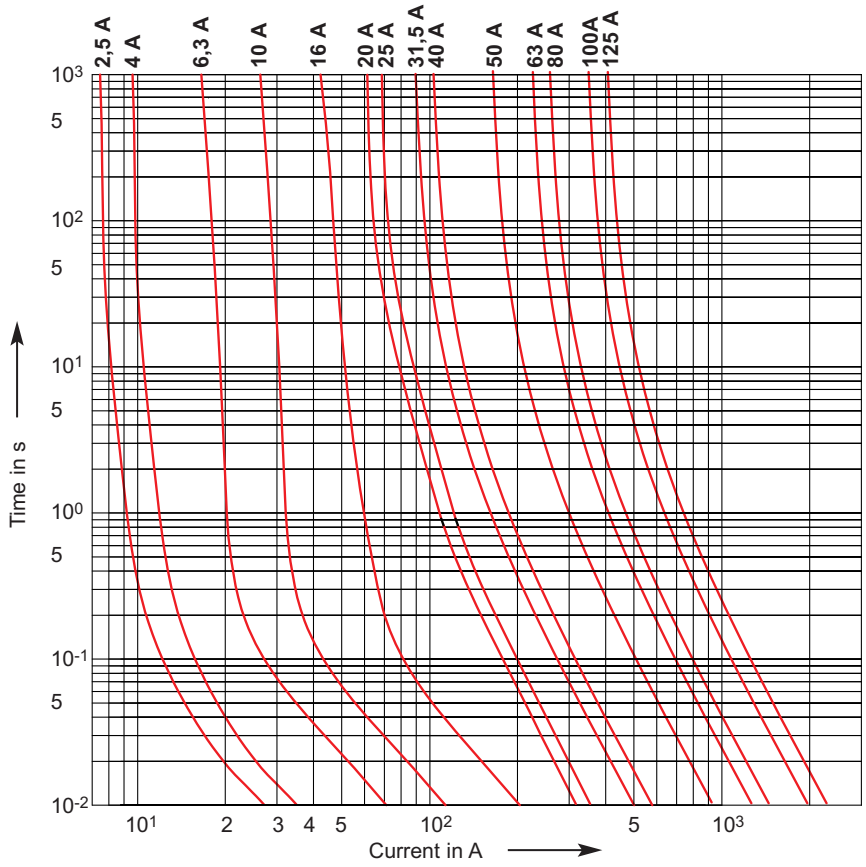
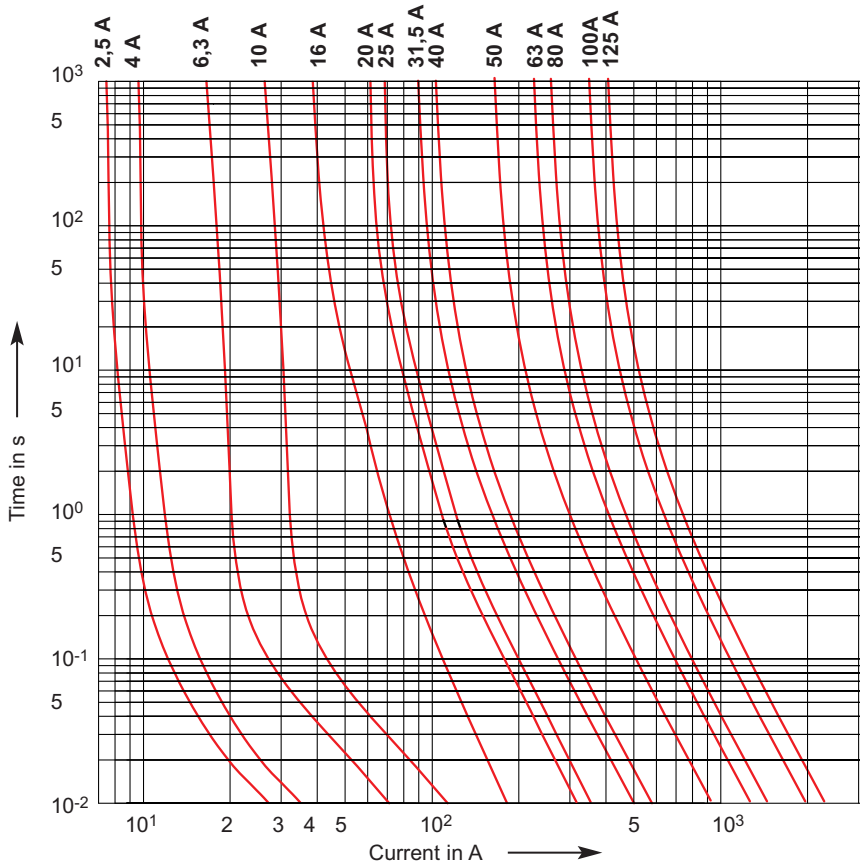
Time/current characteristics for h.v.h.b.c. Type EMPA

12 kV



24 kV



Application of switch-fuse combination

in accordance with EN 62271-105 on distribution transformers

Switch-fuse combinations are used for operational medium voltage-side on and off switching of distribution transformers in secondary substations. They additionally have the task of protecting these transformers against the impact of internal and external faults.

These combinations comprise a functional unit of switch disconnectors and back-up fuses.
By means of the fuses the breaking capacity of the combination is extended beyond that of a simple switch disconnector up to the rated short-circuit breaking current.

The high-voltage high breaking capacity fuse, according to statistics of the VDN (German Association of Electricity Network Operators) is rated as reliable transformer protection. The h.v.h.b.c. fuse in combination with a switch disconnector provides a simple solution which is very economical to procure and run.
This provides a clear-cut advantage over a circuit breaker with the associated current transformers and over-current time protection.
Besides this, the h.v.h.b.c. fuse has a current limiting effect when short-circuits occur and reliably interrupts the fault current of the first half cycle.
These properties are advantageous for the dimensional design of the network.
The following tables give fuse recommendations which take the following points into account:

- inrush current when switching on off-load transformers
- permissible overload 150%
- primary short-circuit interruption upon secondary terminal short circuits

The manufacturer of the combination will provide a recommended list of suitable fuse makes.

Type	Manufacturer
STA / EMPA / SSK	DRIESCHER Moosburg
STA / SSK	SIBA Lünen

Recommended protection for DRIESCHER Switch-fuse combination in accordance with EN 62271-105

Type **STA / EMPA** and Type **SSK**

H.v.h.b.c. fuse link U_r = 12 kV, Fitting dimensions of fuses e = 292 mm

Rated-transformer-power [kVA]	Possible application of the switch-fuse combination Rated voltage U_r = 12 kV		Rated current of the h.v.h.b.c. fuses	
	H27 SEA	H22 SEA	min. [A][3]	max. [A]
50	yes		6,3	6,3
80	yes		10	10
100	yes		10	16
125	yes		16	20
160	yes		20	25
200	yes		25	31,5
250	yes		31,5	40
315	yes		31,5	50
400	yes		40	50
500	yes		50	63
630	yes		63	
800	yes		80 SSK	
1000	yes	delayed[4]	100 SSK	
1250	delayed[4]	no	125 SSK	
1600	no		Circuit-breaker	

[3] only recommended when no l.v.h.b.c. fuse is installed on the low voltage side.

[4] Tripping delay of the switch: 250 ms +0/-50 ms

Recommended protection for DRIESCHER Switch-fuse combination in accordance with EN 62271-105

Type **STA / EMPA** and Type **SSK**

H.v.h.b.c. fuse link U_r = 24 kV, Fitting dimensions of fuses e = 442 mm

Rated-transformer-power [kVA]	Possible application of the switch-fuse combination Rated voltage U_r = 24 kV		Rated current of the h.v.h.b.c. fuse	
	H27 / H29 SEA	**H22 SEA**	min. [A][3]	max. [A]
50	yes		6,3	6,3
80	yes		6,3	6,3
100	yes		6,3	10
125	yes		10	16
160	yes		10	20
200	yes		16	20
250	yes		16	25
315	yes		20	25
400	yes		25	31,5
500	yes		25	40
630	yes		31,5	50
800	yes		40	50
1000	yes		50	63
1250	yes		63	
1600	yes		80	
2000	delayed[5]		100 SSK	
2500	delayed[5]		125 SSK	
3150	no		Circuit-breaker	

Type **STA**

H.v.h.b.c. fuse link U_r = 36 kV, Fitting dimensions of fuses e = 537 mm

Rated-transformer-power [kVA]	Possible application of the switch-fuse combination Rated voltage U_r = 36 kV		Rated current of the h.v.h.b.c. fuse	
	H22 SEA	**H29 SEA**	min. [A][3]	max. [A]
50	yes		6,3	6,3
80	yes		6,3	6,3
100	yes		6,3	10
125	yes		6,3	16
160	yes		6,3	20
200	yes		10	20
250	yes		10	25
315	yes		16	25
400	yes		20	25
500	yes		25	31,5
630	yes		31,5	31,5
800	yes		31,5	40
1000	yes		40	40
1250	yes		40	50
1600	yes		50	63
2000	yes		63	
2500	delayed[5]		80	
3150	delayed[5]		100	
4000	no		Circuit-breaker	

[3] only recommended when no l.v.h.b.c. fuse is installed on the low voltage side.

[5] Tripping delay of the switch : 500 ms +0/-50 ms

Thermal protection

All DRIESCHER h.v.h.b.c. fuses with a release force of 80 N and a rated current of up to 160 A are equipped with thermal protection as standard. This thermal protection is for preventing impermissibly high temperatures developing in insulated or gas-insulated switchgear.

Important:
Incorrect assignment of the h.v.h.b.c. fuses for the equipment to be protected (e.g. transformer) can lead to faults if

a) the fuse is rated too low, through partial break of the fuse element as a result of the starting current inrush which, with auto-reclose, can occur several times in succession in an uncontrolled manner,

b) the fuse is rated too high, in that when a short circuit occurs on the transformer low-voltage side (between transformer connection and low-voltage protection) or permanent overload of the transformer, the current flowing through the h.v.h.b.c. fuse is below its minimum breaking current.

In these and other cases the thermal protection devices release the striker pin and trip the associated switch – usually a load-break switch – before the temperatures at the fuse reach a value endangering the thermal strength, of the porcelain tube, for example.

Testing cartridge

Testing cartridges are used to test the mechanical function of switch disconnectors with mounted high-voltage high breaking capacity fuses and striker in the dead condition.The dimensions are the same like the original high-voltage high breaking capacity fuses according to DIN 43625.

The release is effected through pressing the push button 1 what causes the ejection of the striker with a release force of 70 N / 100 N and a path length of 30 mm.
During this functional test it is ensured that high-voltage high breaking capacity fuses with a release force of 80 N / 120 N and a path length of 30 / 35 mm are able to release a switch-fuse combination safely and properly. After each release the striker has to be pushed in again.

The testing cartridges are clearly marked and have a plastic tube instead of a porcelain tube.

Caution !
Only use testing cartridges in the **dead condition**!

To keep the release force of the testing cartridges constant for years, it is necessary to store them in a released condition (with released striker).

All testing cartridges are marked through a fabrication number.The corresponding test badge (2) shows the date the testing cartridge has to sent back to the factory for being newly calibrated.

Testing cartridge	Release force	Part No.	Weight approx.
12 kV	70 N	772 13040	1.5 kg
24 kV	70 N	772 13050	1.6 kg
36 kV	70 N	772 13060	1.8 kg
24 kV	100 N	772 13120	1.7 kg

Bypass tubes 12 - 36 kV

For use in place of h.v.h.b.c. fuses.
Dimensions according to DIN 43625; up to I_r max. 300 A

Part No.	Rated voltage U_r	Drawing No.
772 14130	12 kV	044808-001
772 14210	12 kV with heat-shrinkable tube	044808-005
772 14230	24 kV	044808-002
772 14240	24 kV with heat-shrinkable tube	044808-004
772 14330	36 kV	044808-003

Fuse holders

Holder for 3 x h.v.h.b.c. fuses 6 - 30 kV,
made of hot-galvanised steel plate

Part No.	Drawing No.
773 60100	HH 4-014350

Fuse extension

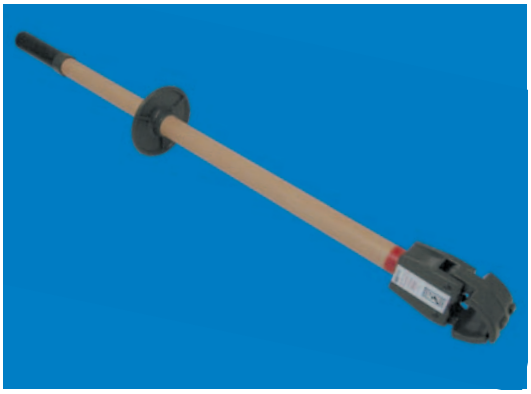
Extensionadapter for h.v.h.b.c. fuses

Part No.	Rated voltage U_r	Drawing No.
790 20010	from 12 kV to 24 kV, screwable	097311-001
790 30010	from 12 kV to 36 kV, screwable	097311-002
790 30020	from 24 kV to 36 kV, screwable	097311-003
790 20050	from 12 kV to 24 kV, pluggable	

Fuse tongs

The fuse tongs are suitable for specified use (VDE 0105) for switchgears according to DIN VDE 0101 and EN 62271-200. The narrow and symmetrical head of the tongs permits the use of the tongs in small-scale panels.
The tongs must be kept in a dry place which is free from dust.

Part No.	Rated voltage U_r	Type	Drawing No.	Length
772 12110	up to 36 kV	straight	HE4-098650	1500 mm
772 12101	up to 36 kV	straight	HE4-098650	1060 mm
772 12201	up to 36 kV	angled	HE4-102322	1250 mm



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