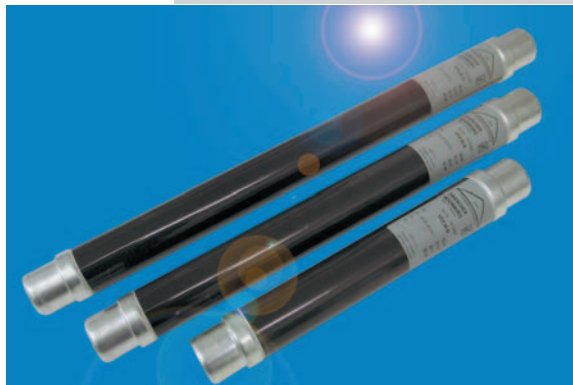


**DRIESCHER -  
High-voltage high breaking  
capacity fuses from  
12 kV up to 36 kV**



**ELEKTROTECHNISCHE WERKE  
FRITZ DRIESCHER & SÖHNE GMBH**

D-85366 Moosburg • Phone: +49 8761 681-0 • Fax: +49 8761 681-137  
www.driescher.com info@service@driescher.de



## DRIESCHER - High-voltage high breaking capacity fuses

according to EN 60282-1

• 3

General description • types • design • the striker pin

• 4

H.v.h.b.c. fuses type STA with striker and thermal protection up to 160 A

• 5

H.v.h.b.c. fuses type SSK with striker and thermal protection up to 125 A

• 6

Limitation of short-circuit current

• 8

Time-current characteristic for h.v.h.b.c. fuses 6,3 A up to 160 A

• 9

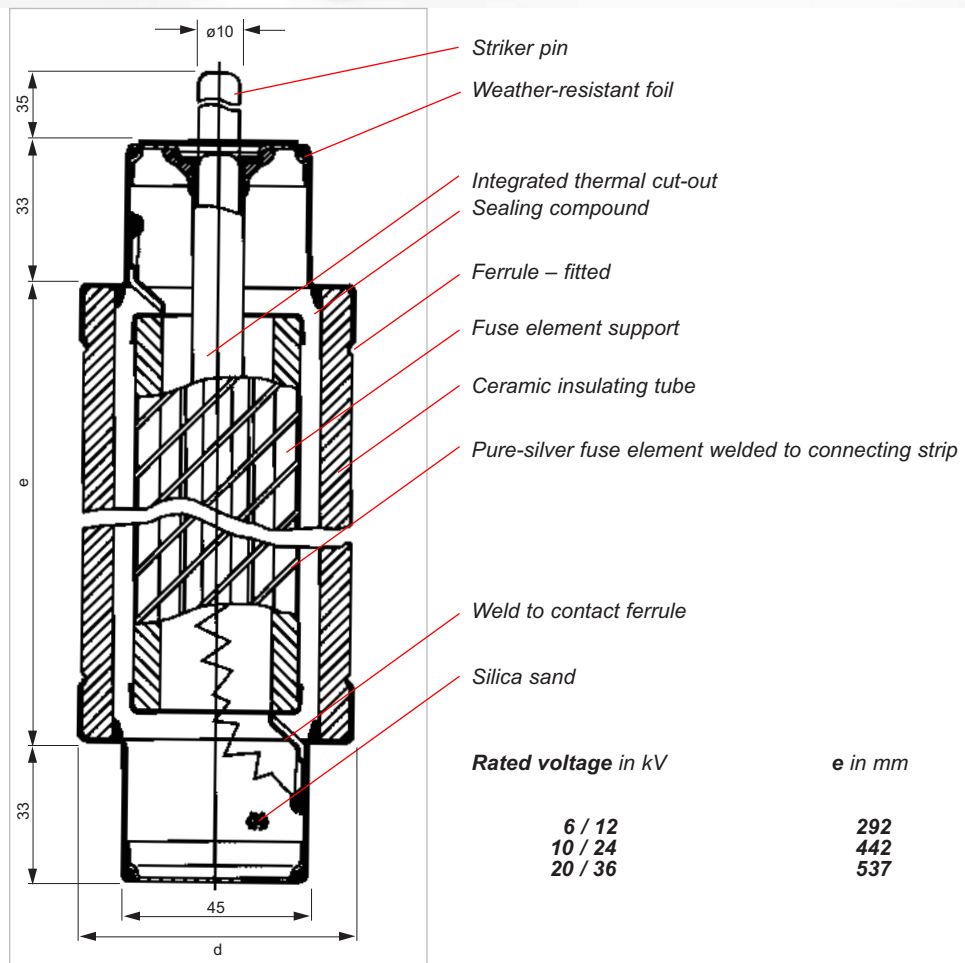
Recommended protection for DRIESCHER - Switch-fuse combination

• 11

Thermal protection • Testing cartridge

• 12

Bypass tubes • fuse tongs • fuse holders • fuse extension

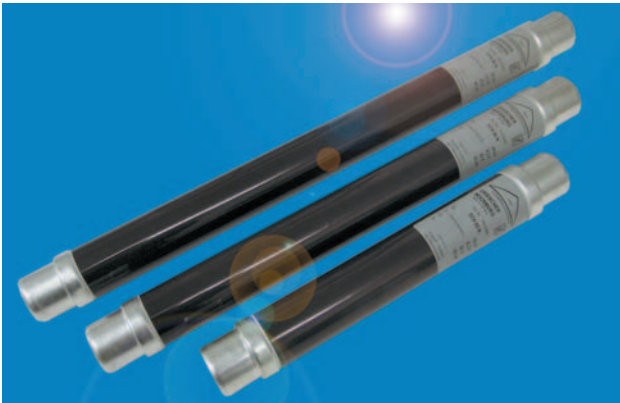


Pic.: 1

## 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 DIN EN 60282-1, IEC 60787, IEC 60644, IEC 60549, and EN 62271-105.

## 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	Part No:
12 kV	796 15... (according to A)
24 kV	796 25... (according to A)
36 kV	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 sup-

port 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 and thermal protection up to 160 A

## Type STA, release force 80 N

Rated voltage [kV]	Rated current [A]	e <sup>2)</sup> [mm]	d <sup>2)</sup> [mm]	Weight [kg]	Rated breaking current I <sub>1</sub> [kA]	Minimum breaking current I <sub>3</sub> [A]	power loss [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	160RC125 <sup>3)</sup>	292	85	3,8	63	600	96	797 10160
10 / 24	2	442	53	2,2	63	16	13,5	797 20002
10 / 24	4	442	53	2,2	63	32	24	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	40	390	320	797 20125
10 / 24	160RC100 <sup>3)</sup>	442	85	5,6	40	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	79	797 30016
20 / 36	20	537	53	2,6	40	70	66	797 30020
20 / 36	25	537	53	2,6	40	90	87	797 30025
20 / 36	31,5	537	67	3,5	40	110	102	797 30030
20 / 36	40	537	67	3,5	40	140	144	797 30040
20 / 36	50	537	85	6,0	40	170	186	797 30050
20 / 36	63	537	85	6,0	40	210	224	797 30063
20 / 36	80RC63 <sup>3)</sup>	537	85	6,0	40	280	145	797 30080
20 / 36	100RC71 <sup>3)</sup>	537	85	6,0	40	350	162	797 30100

<sup>2)</sup> see page 2, Pic.: 1

<sup>3)</sup> 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 SSK and thermal protection up to 125 A

### Type SSK, release force 80 N

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 times and 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).

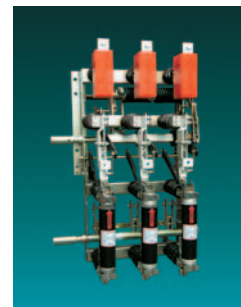
The determination of the rated current of the fuses for the transformer protection is effected according to the recommendations of the fuse manufacturers following VDE 0670 Part 402.

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
- low values of the minimum breaking current  $I_3$



Rated voltage [kV]	Rated current [A]	e <sup>2)</sup> [mm]	d <sup>2)</sup> [mm]	Weight [kg]	Maximum breaking current $I_f$ [kA]	Minimum breaking current $I_3$ [A]	Power loss [W]	Part No.
6 / 12	63	292	67	2,0	63	210	62	797 19063
6 / 12	80	292	67	2,0	63	260	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	80	442	67	2,9	63	260	143	797 29080
10 / 24	100	442	85	5,4	63	320	188	797 29100
10 / 24	125	442	85	6,3	63	450	277	797 29125

<sup>2)</sup> see page 2, 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).

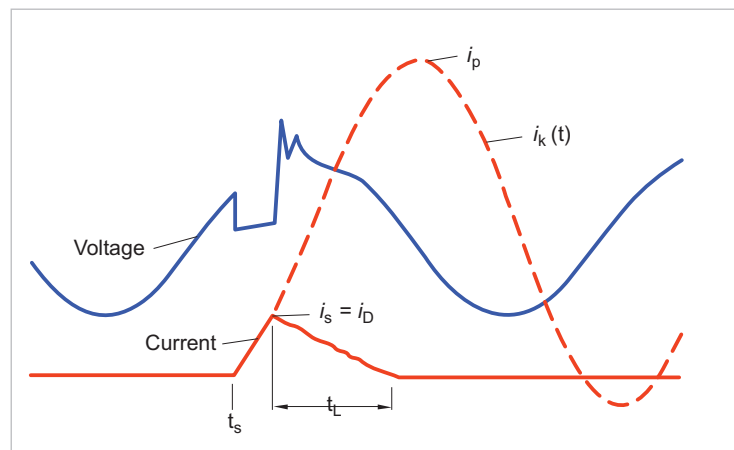
The current limiting action of the fuse, however, only permits the cut-off current  $i_D$  to rise up to the height of the melting current  $i_s$  (full line).

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

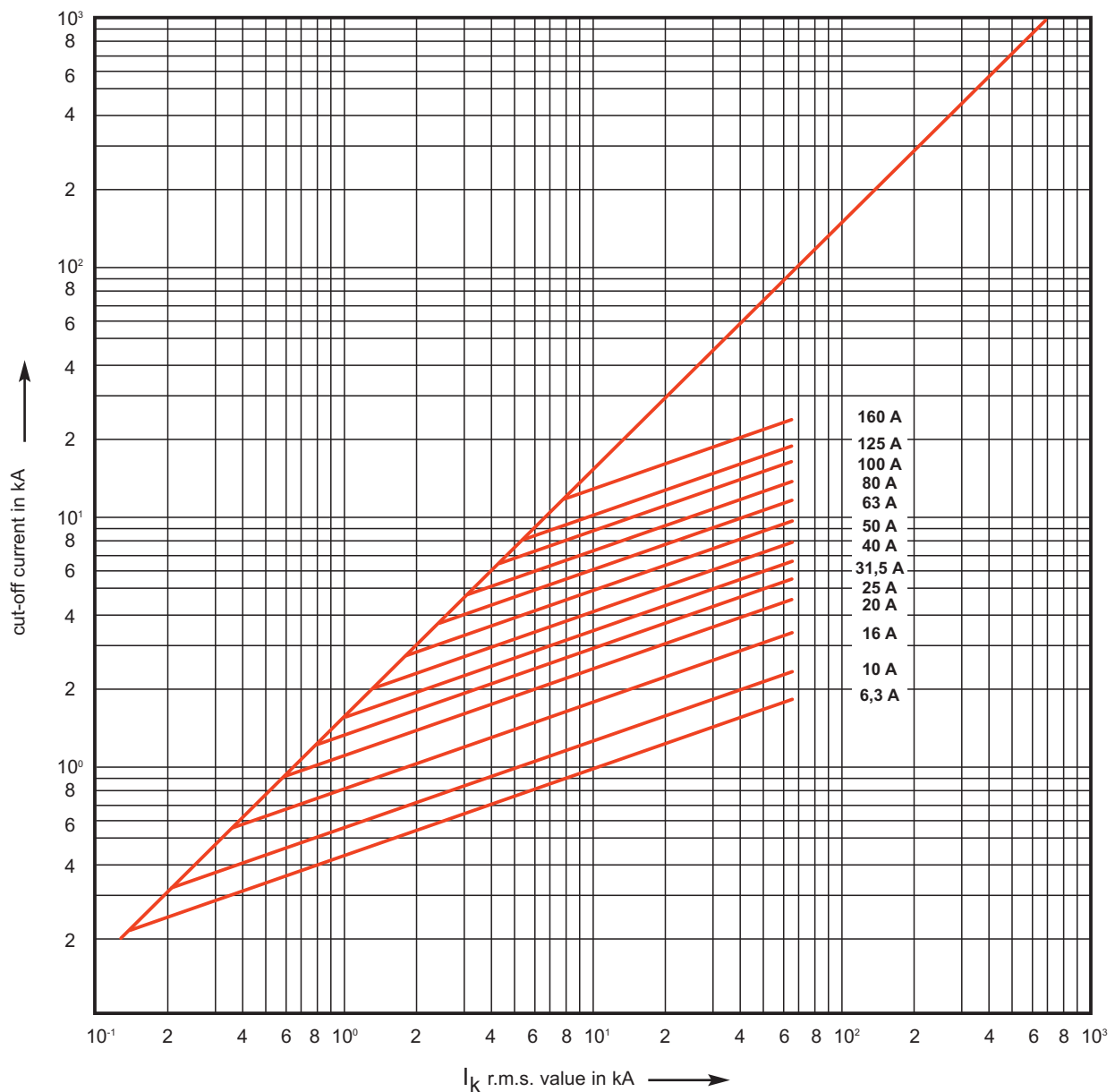


## Short-circuit current limitation

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.

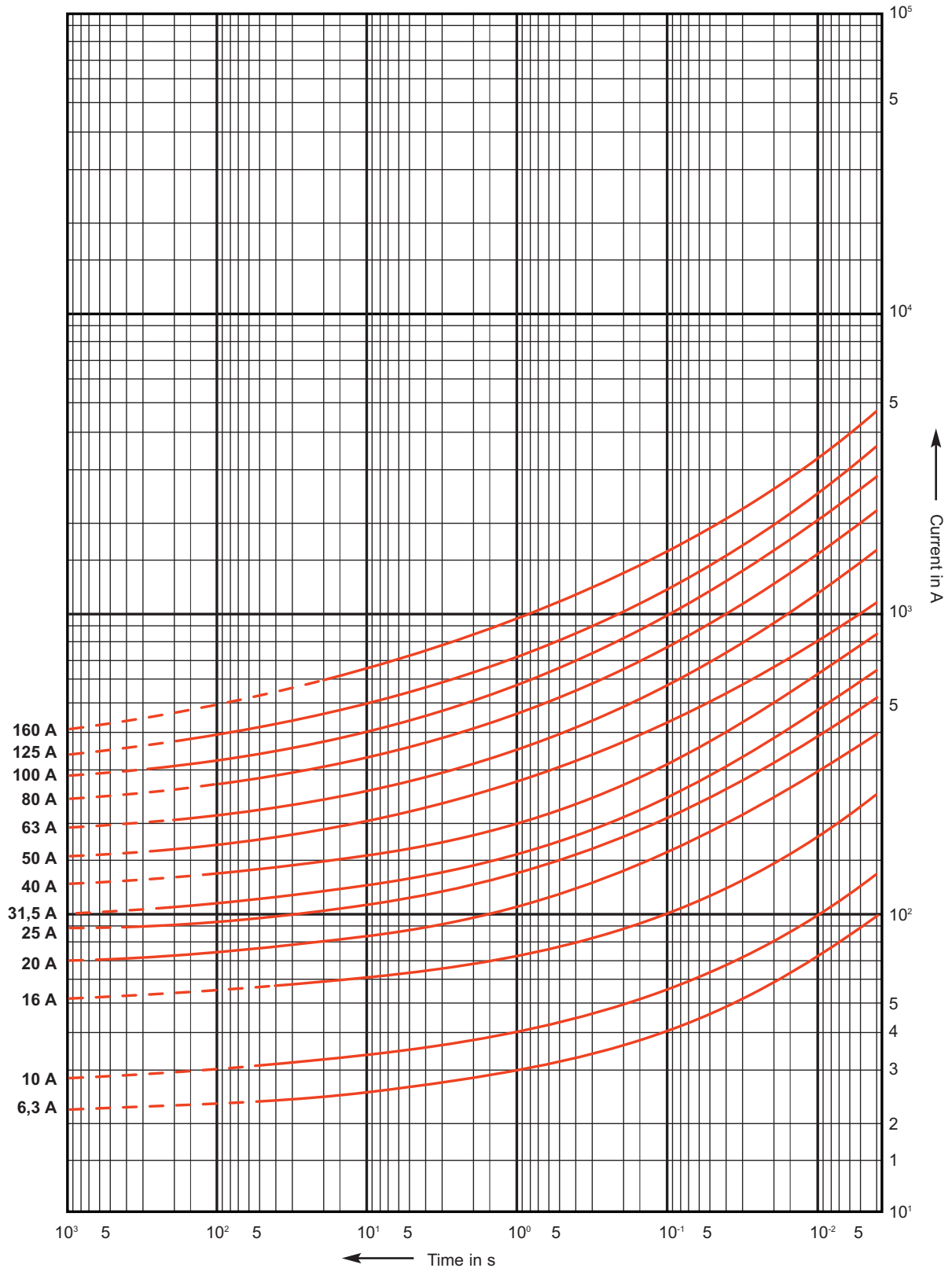
The cut-off currents determined give the maximum value which might occur for a given r.m.s. value of the symmetrical component of the prospective short-circuit current with highest rate of current rise. Actual values are thus, as a rule, below the values determined.



## Time/current characteristics for DRIESCHER h.v.h.b.c fuses from 6.3 to 160 A

The diagram below shows the pre-arcing 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.





## 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 overcurrent 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 circuit

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

Type	Manufacturer
STA	DRIESCHER Moosburg
SSK	Siba Lünen

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

Fuse-Type STA and Type SSK

## High-voltage high breaking capacity fuse link for $U_r = 12$ kV

Fitting dimensions of fuses  $e = 292^{-1}$  mm

Rated-transformer-power [kVA]	Possible application of the switch-fuse combination			Rated current of the h.v.h.b.c. fuse	
	Rated voltage $U_r = 12$ kV			mind. (A)**	max. (A)
	H27	H22	M3007		
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	no	80, Type SSK	
1000	yes	delayed*	no	100, Type SSK	
1250	delayed*		no	125, Type SSK	
1600		no		circuit-breaker	

\* Tripping delay of the switch: 250 ms +0/-50 ms

\*\* only recommended when no l.v.h.b.c. fuse is installed on the low voltage side.

## High-voltage high breaking capacity fuse link for $U_r = 24$ kV

Fitting dimensions of fuses  $e = 442^{-1}$  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	H22	M3007	mind. (A)**	max. (A)
	50		yes		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		no		80
2000	delayed*		no		100, Type SSK
2500	delayed*		no		125, Type SSK
3150		no			circuit-breaker

\* Tripping delay of the switch: 500 ms +0/-50 ms

\*\* only recommended when no l.v.h.b.c. fuse is installed on the low voltage side.

## High-voltage high breaking capacity fuse link for $U_r = 36$ kV

Fitting dimensions of fuses  $e = 537^{-1}$  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	
	H29	H22	M3007	mind. (A)**	max. (A)
	50		yes		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*		no		80
3150	delayed*		no		100
4000		no			circuit-breaker

\* Tripping delay of the switch: 500 ms +0/-50 ms

\*\* only recommended when no l.v.h.b.c. fuse is installed on the low voltage side.

## 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 switchgears.

### 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 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 and a path length of 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).

Since April 1st, 2003 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	Part No.	Weight approx. [kg]
12 kV	772 13040	3,2
24 kV	772 13050	4
36 kV	772 13060	5

## 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 $I_r$	Drawing No.
772 14130	12 kV	044808-000
772 14210	12 kV with heat-shrinkable tube	044808-000
772 14230	24 kV	044808-000
772 14240	24 kV with heat-shrinkable tube	044808-000
772 14330	36 kV	044808-000



## 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 4-14350



## Fuse extension

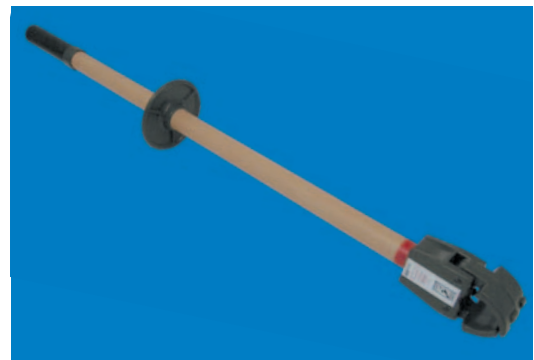
Extensionadapter for h.v.h.b.c. fuses

Part No.	Rated voltage $I_r$	Drawing No.
790 20010	from 10 kV to 20 kV, screwable	HB-61201
790 30010	from 10 kV to 30 kV, screwable	HB-61201
790 30020	from 20 kV to 30 kV, screwable	HB-61201
790 20050	from 10 kV to 20 kV, pluggable	HB-61201

## 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 $I_r$	Type	Drawing No.	Length
772 12110	up to 30 kV	straight	HE4-98650	1500 mm
772 12101	up to 30 kV	straight	HE4-98650	1060 mm
772 12201	up to 30 kV	angled	HE4-102322	1250 mm



Dimensions, weights, diagrams and descriptions in this brochure are non-binding. Subject to change without notice.

**STROM • SICHER • SCHALTEN**

Printed on chlorine free bleached paper. For nature's sake.

**ELEKTROTECHNISCHE WERKE  
FRITZ DRIESCHER & SÖHNE GMBH**

D-85366 Moosburg • Phone: +49 8761 681-0 • Fax: +49 8761 681-137  
www.driescher.com info@service@driescher.de

