



SAME RATED CURRENT DOESN'T MEAN SAME PROTECTION

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Points of interest:

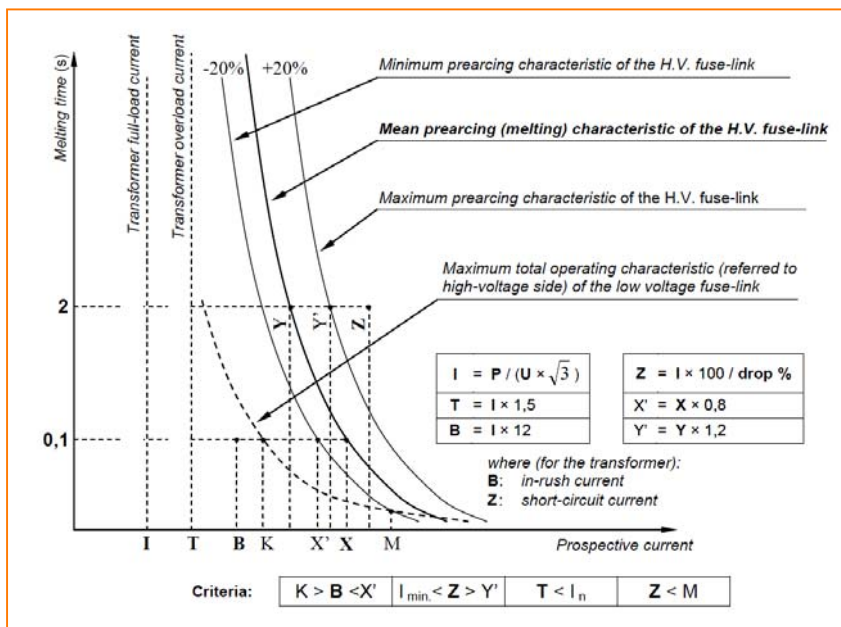
- IEC 60787 Standard introduces very precise criteria for the selection of high voltage fuse-links for the protection of transformers
- Voltage and current ratings are not the only features required to determine applicability of fuse-links. The shape of time-current characteristics curve is essential.

Introductory message

The purpose of this communication is not to denigrate professional designers and vendors of solutions for electrical protection but to illustrate how tricky is the comparison of electrical protection devices.

Comparison of two general purpose high voltage fuse-links

IEC 60787 Standard introduces very precise selection criteria as shown below. These criteria apply to the selection of high-voltage fuse-links once both in-rush and short-circuit currents of the transformer to be protected are known.



Let us compare two ranges of 12kV general purpose high voltage fuse-links from Siba and Mersen (Limitor®-G) in accordance with IEC 60787.

Current rating (A)	MERSEN (Limitor®-G)		SIBA (HHD-G)
	Catalog Number	Reference Number	Artikel Nummer
6,3	45DG120V6,3P	W1000151A	30 004 93.6,3
10	45DG120V10P	X1000152A	30 012 93.10
16	45DG120V16P	Y1000153A	30 012 93.16
25	45DG120V25P	Z1000154A	30 012 93.25
40	45DG120V40P	A1000155A	30 012 93.40
50	45DG120V50P	B1000156A	30 020 93.50

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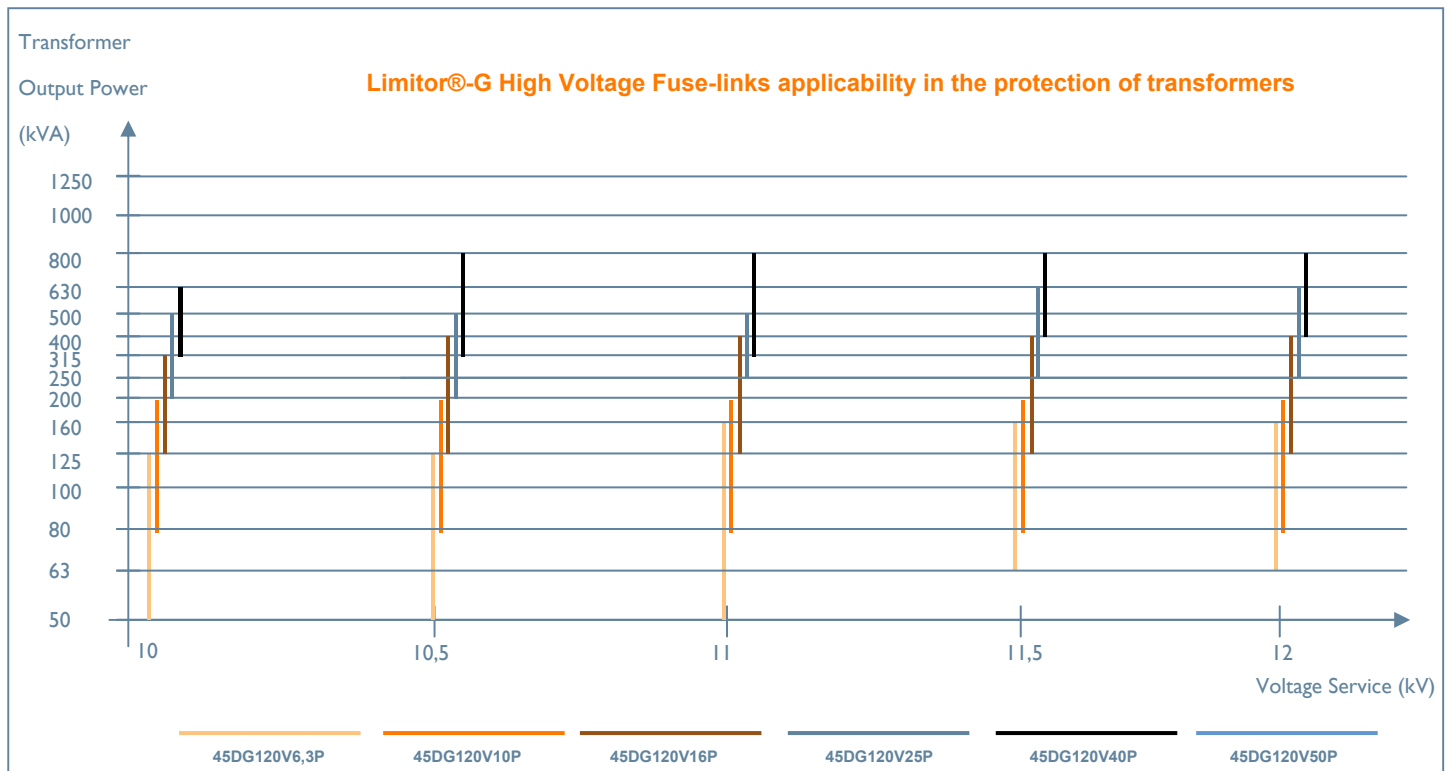
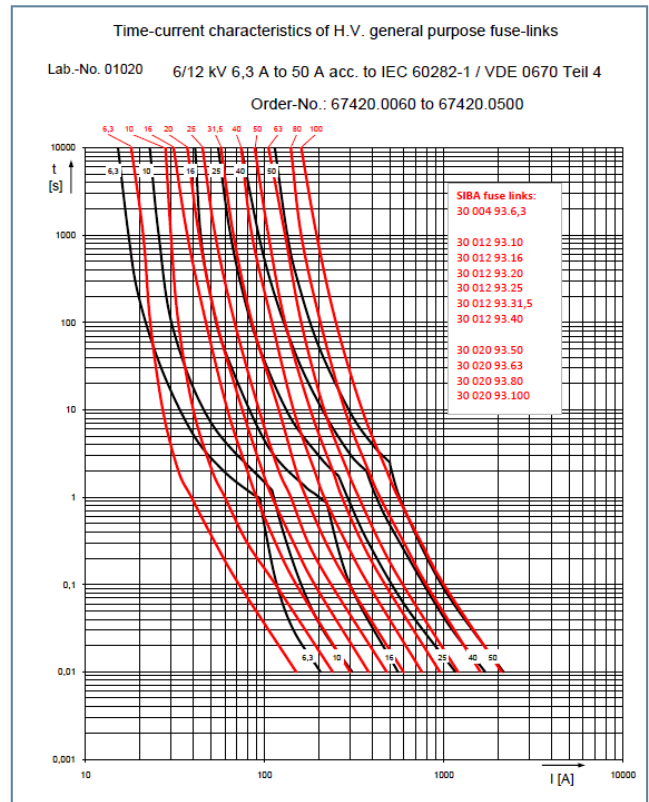
For the comparison some assumptions have been made:

Short-circuit voltage (drop) = 4%

In-rush current (B) = 12 x rated current of the transformer

Tolerance on current for the time-current characteristics = +/- 12%

Once taking in account the time-current characteristics of the Mersen Limitor®-G fuse-links, we can publish an application chart of our fuse-links depending on voltage service and transformer output power (refer below).



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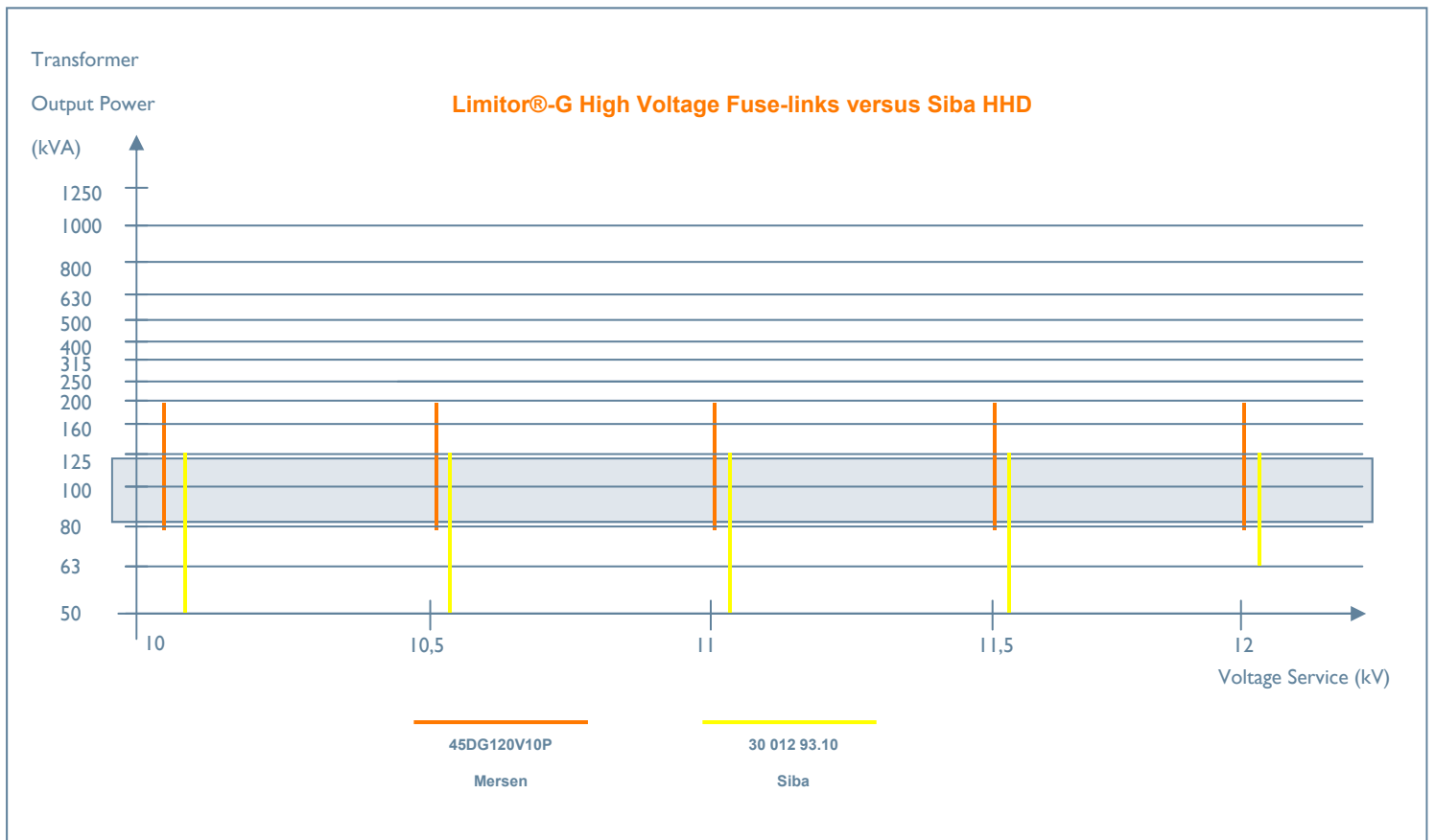
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With the same assumptions as previously if we focus on the 10-Amp rated high voltage general purpose fuse-links when comparing the two items 45DG120V10P from Mersen and 30 012 93.10 from Siba we show that the two fuse-links are equivalent in terms of protection for transformers having an output power lying between 80 and 125kVA only.

The same current-rated fuse-link from Mersen is capable of protecting transformers with higher output power for the same voltage service.



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SIBA HHD-G-Sicherungseinsätze nach DIN Standard / Fuse-Links acc. DIN Standard

6/12 kV "e" = 292 mm

Vorzugsabmessung / Standard dimension

Einsatz / Application
Luft- und gasisolierte Mittelspannungsschaltanlagen / Air and gas insulated switchgear for indoor- and outdoor applications / indoor and outdoor application

Verpackung / Packing 1 Stück / 1 piece

Betriebsklasse / Class **Vielfachbereich** / **General purpose** **IEC 60282-1** **DIN 43 625** **VDE 0670-4**

Bemessungsspannung Rated Voltage	Artikel Article	Bemessungsstrom Rated Current	Länge "e" Length "e"	Durchmesser D Diameter D
kV		A	mm	mm
6/12	30 004 93	6,3	292	53
	30 012 93	8 - 40		67
	30 020 93	50 - 100		85

Bemessungsstrom Rated Current	Artikel Nr. Article No.	Gewicht Weight	Bemessungs- sicherungsstrom Rated Breaking Current - I _n	Schmelzenergie Pre-Arcing P _t -Value	Ausschaltenergie Total P _t -Value	Leistungsverlust Power Loss	Kaltwiderstand Cold Resistance
A		kg/l	A	A ² s	A ² s	W	mΩ
6,3	30 004 93.6,3	1,6	63	110	900	7	150
8	30 012 93.8	2,0	63	180	1.400	9	120
10	30 012 93.10	2,0	63	240	2.000	12	100
16	30 012 93.16	2,0	63	530	4.400	12	40
20	30 012 93.20	2,0	63	850	7.000	15	31
25	30 012 93.25	2,0	63	1.330	11.000	18	25
31,5	30 012 93.31,5	2,0	63	2.100	18.000	23	20
40	30 012 93.40	2,0	63	3.400	28.000	29	16
50	30 020 93.50	3,8	63	5.500	33.000	42	15
63	30 020 93.63	3,8	63	8.500	68.000	54	12
80	30 020 93.80	3,8	63	16.200	142.000	79	9
100	30 020 93.100	3,8	63	23.500	183.000	108	7,7

SIBA HHD-G-Sicherungseinsätze nach DIN Standard / Fuse-Links acc. DIN Standard

6/12 kV "e" = 292 mm

Zeit/Strom-Kennlinie
Time-current characteristic

Durchlass-Strom
Cut-off current

HH-Katalog / HV-Catalogue © 2009-09 SIBA

Limitor®-G General Purpose fuse-links according to IEC 60282-1

Selection table

Rated voltage range of fuse-link (kV) Service voltage of transformer (kV)	Mode of protection Rated current of fuse-link (A)	Transformer output (kVA)											U ₁ = 2%
		50	100	125	160	200	250	315	400	500	630	800	
6/12	Transformer rated current (A)	4,8	9,6	12	15,4	19,2	24,1	30,3	38,5	48,1	60,6	77,1	96,3
	Rated current of fuse-link (A)	6,3	16	16	16-25	25	25-40	40	40-50	50	50	-	-
6/12	Transformer rated current (A)	2,9	5,8	7,2	9,2	11,5	14,4	18,2	23,1	29,9	36,4	46,2	57,7
	Rated current of fuse-link (A)	6,3	6,3-10	10	16	16	16-25	25	25-40	40	40-50	50	50
10/24	Transformer rated current (A)	1,5	2,9	3,6	4,6	5,8	7,2	9,1	11,5	14,4	18,2	23,1	29,9
	Rated current of fuse-link (A)	-	4	4-6,3	6,3	6,3-10	10	16	16	16	25	25	25

Table 5

Catalog Number	Reference Number	Range	U _n (kV)	I _n (A)	L (mm)	D (mm)	L (kA)	R (mΩ)	P (W)	IT (kA ² s)	Weight (kg)
4SDG120V6,3P	Y1000151A	General Purpose, stick	6/12	6,3	292	65	40	128	6	2	2,3
4SDG120V10P	X1000152A	General Purpose, stick	6/12	10	292	65	40	70	8	3,8	2,3
4SDG120V16P	Y1000153A	General Purpose, stick	6/12	16	292	65	40	35	10	14	2,3
4SDG120V25P	Z1000154A	General Purpose, stick	6/12	25	292	65	40	20,5	15	36	2,3
4SDG120V40P	A1000155A	General Purpose, stick	6/12	40	292	78	40	12,2	24	110	3,1
4SDG120V50P	B1000156A	General Purpose, stick	6/12	50	292	88	40	9,9	31	150	3,7
4SDG240V40P	C1000157A	General Purpose, stick	10/24	40	442	78	40	280	5	1,8	4,1
4SDG240V6,3P	D1000158A	General Purpose, stick	10/24	6,3	442	78	40	256,5	11	2	4,1
4SDG240V10P	E1000159A	General Purpose, stick	10/24	10	442	78	40	135	15	3,6	4,1
4SDG240V16P	F1000160A	General Purpose, stick	10/24	16	442	78	40	70,3	21	14	4,1
4SDG240V25P	G1000161A	General Purpose, stick	10/24	25	442	88	40	41,2	31	39	4,5

Time-current characteristics

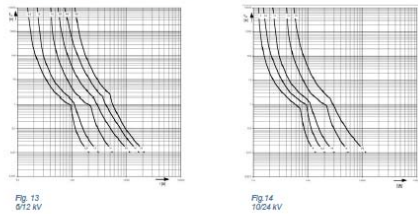


Fig. 13 6/12 kV

Fig. 14 10/24 kV

Abstracts from Siba and Mersen technical literature

Siba
HHD Fuses
High-Voltage Fuses acc. DIN 43 625
Technical Data Types of Fuses

Mersen
High Voltage Fuse-links according to IEC 60282-1 and VDE 0670 T4
Product Brochure

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