VV/HH

KEMA Labs

High voltage fuses

ETI Power needs control

High voltage fuse-links

High voltage high-breaking capacity VV fuse-links

General information

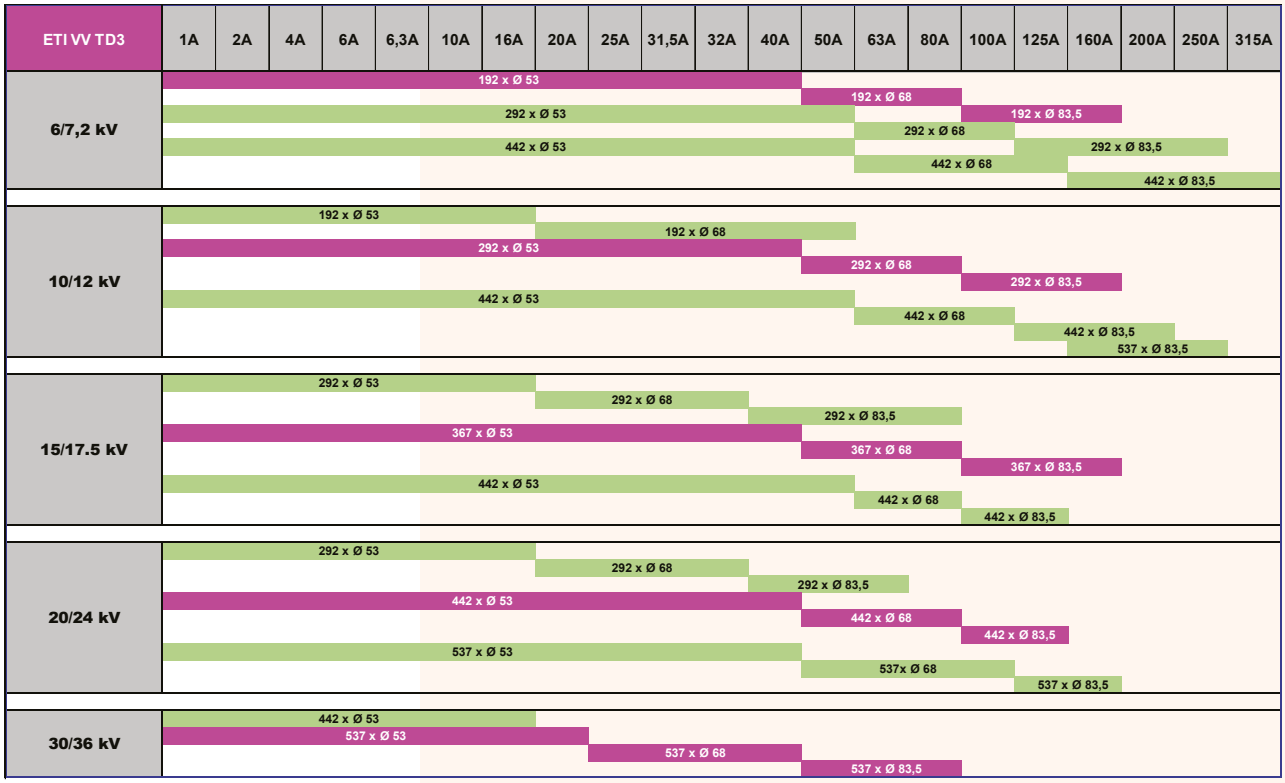
ETI HV (High-voltage Current-limiting fuse-links) named VVT TD3 are designed to protect devices in switch-gears and other equipment (distribution transformers, power capacitors, MV motors) from thermal and dynamic effects of short-circuits and over-currents. Time-current characteristics correspond to standard IEC 60282-1, item 3.3.3. Back-up fuse. They are suitable for installation in:

- indoor and outdoor RMU (Ring-Main Units) switchgear
- SF6 - insulated enclosures
- special service conditions (different from normal conditions, described in item 4.1. of standard IEC 60282-1)

The most significant features of ETI VVT TD3 high-voltage fuses:

- Low temperature rise because of low power dissipation
- Low minimum breaking currents
- High breaking capacity 63 kA (up to 24kV)
- Two types of striker pins: 50N and 80 N (with integrated temperature dependent limiter)
- Reliable sealing system against humidity irruption
- Low switching voltages
- Upon a request, fuse links can be supplied into non-standard dimensions

Overview of standard and non-standard dimensions



* purple: standard dimensions
** green: non-standard dimensions

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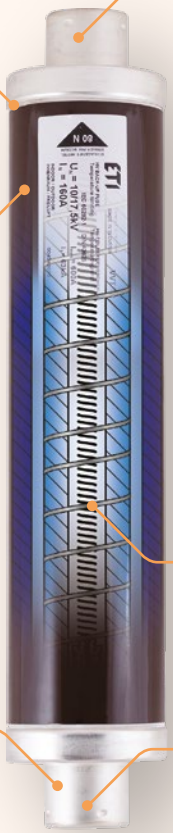
→ KEMA type test reports

→ Reliable sealing system against humidity irruption

→ High endurance ceramic tube



→ Striker system: a temperature sensitive element, which does not react to short time overloads, only to inadmissible values of temperatures. Convenient for the protection of the fuse-links, installed in enclosures or SF6 switchgears

→ Rigid striker pin

→ Various striker variants (50N, 80N, without striker, thermo, non-thermo...)

→ Low temperature rise because of low power dissipation

→ Low minimum breaking currents

→ Low switching voltages

→ High breaking capacity 63 kA

→ Silver melting element

→ Galvanically protected contact caps made of electrolytic copper can be nickel (Ni), tin (Sn) or silver (Ag) plated

→ Easier mounting because of improved contact cap

Standards

ETI MV/VV High voltage fuse-links comply with the following standards and specifications:

- IEC 60282-1 "Current-limiting fuses", Edition 8.0 from 2020-04
- DIN 43625 "Hochspannungs-Sicherungen; Nennspannung 3,6 bis 36kV; maβe für Sicherungseinsätze"
- VDE 0670 T402, Wechselstromschaltgeräte für Spannungen über 1kV, "Auswahl von strombegrenzenden Sicherungseinsätzen für Transformatorstromkreise"
- IEC TR 62655 "Tutorial and application guide for high-voltage fuses"
- IEC 60644 "Specification for high-voltage fuse-links for motor circuit applications"
- IEC 60549 "High-voltage fuses for external protection of shunt capacitors"

Certificates, Test reports

- KEMA Type Test Certificates of breaking performance
- Test reports for 25kV, 38.5kV, 40.5kV and 42kV versions

Construction:

ETI High voltage fuse-links are designed to assure stable and reliable technical characteristics. The glazed porcelain tube (made in ETI own ceramic factory) is extremely high mechanical and thermal resistant.
Galvanically protected contact caps made of electrolytic copper are nickel (Ni) or tin (Sn) or upon customer request silver (Ag) plated. Caps are rolled by pressing into the groove of the tube. The tightness of this connection is assured by a special seal resistant to ageing and high temperatures.
The design and method of production of the melting elements ensures precisely tolerances and stable time/current characteristics. Fuse elements are wounded on a ceramic carrier and electrically welded on a special copper strips.
The inside of the tube is filled with quartz sand with an exactly determined granulation and chemical structure. The sand guarantees good and reliable extinguishing of the electric arc.
An important element in the fuse-link construction is also the striker system. Part of that system is temperature sensitive element, which reacts in cases of temperature increasing of the fuse-link due to various reasons. The system reacts in such a way that short time overloads do not cause the fuse to interrupt the circuit unnecessarily. Only when inadmissible values of temperatures are exceeded, the fuse-link open the switch via the striker pin.
Because of these characteristics, ETI "thermal" striker pin is convenient for the protection of the fuse-links, installed in enclosures or SF6 switchgears, which requires additional protection features against inadmissible temperatures.

Striker pin Type description:

- VVA3; without striker
- VVC3; 50N striker force.
- VVT-D3; 80N striker force, with temperature limiter (VVT)

Ordering Code Numbers

rated voltage U_n [kV]	Dimension "e" according to DIN and IEC (mm)	rated current [A]	VVA (without striker pin)	VVC3 Striker type 50N	VVT-D3 Striker type 80N THERMO		Tube diameter "d" (mm)	weight [kg]
					Ni plated contacts	Ag plated contacts*		
10/24	292	2 A		004250103	004252103		53	1.6
		4 A		004250104	004252104			
		6 A		004250105	004252105			
		6,3 A		004250106	004252106			
		10 A		004250107	004252107			
		16 A		004250108	004252108			
		20 A		004250109	004252109		68	2.8
		25 A		004250110	004252110			
		31,5 A		004250111	004252111			
		32 A		004250112	004252112			
		40 A		004250113	004252113		83,5	4.0
		50A		004250114	004252114			
		63 A		004250115	004252115			
	442	1 A	004251102				53	2.3
		2 A	004251103	004250003	004252003	004252033		
		4 A	004251104	004250004	004252004	004252034		
		6 A	004251105	004250005	004252005	004252035		
		6,3 A	004251106	004250006	004252006	004252036		
		10 A	004251107	004250007	004252007	004252037		
		16 A	004251108	004250008	004252008	004252038		
		20 A	004251109	004250009	004252009	004252039		
		25 A	004251110	004250010	004252010	004252040		
		31,5 A	004251111	004250011	004252011	004252041		
		32 A	004251112	004250012	004252012	004252042		
		40 A	004251113	004250013	004252013	004252043		
		50 A	004251114	004250014	004252014	004252044	68	3.9
		63 A	004251115	004250015	004252015	004252045		
		80A	004251116	004250016	004252016	004252046		
		100 A	004251117	004250017	004252017	004252047	83,5	5.8
		125A	004251118	004250018	004252018	004252048		
	537	2 A		004250503	004252503		53	2.8
		4 A		004250504	004252504			
		6 A		004250505	004252505			
		6,3 A		004250506	004252506			
		10 A		004250507	004252507			
		16 A		004250508	004252508			
		20 A		004250509	004252509			
		25 A		004250510	004252510			
		31,5 A		004250511	004252511			
		32 A		004250512	004252512			
		40 A		004250513	004252513			
		50 A		004250514	004252514		68	4.7
		63 A		004250515	004252515			
		80A		004250516	004252516			
		100 A		004250517	004252517			
		125 A		004250518	004252518		83,5	7.0
		160 A		004250519	004252519			

Note 1: Other ratings and dimensions can be supplied by customer request. For particular applications, please contact ETI technical team.
Note 2: Orange colored types according to IEC 60282-1 dimensions.
* Other dimensions available upon request

Technical data on page 902

Technical data

rated voltage [kV]	Dimension "e" according to DIN and IEC (mm)	rated current I_n [A]	Striker type	Rated breaking capacity (kA)	Rated minimum breaking current (A)	cold resistance [mΩ]	power dissipation [W]	pre-arcing I^2t value [A^2s]	total I^2t value [A^2s]
10/24	292	2	C-type, D-type	31,5	12	2040	12	6,1	57
		4			20	1300	35	17,3	164
		6			27	900	56	36	340
		6,3			27	900	56	36	340
		10			42	230	25,5	165	1.450
		16			64	125	42	320	5.200
		20			80	76	39,5	450	7.000
		25			100	59	49	700	10.000
		31,5			126	52	75	1.400	15.000
		32			126	52	59	1.400	15.000
		40			160	38	94	3.200	27.000
		50			200	29	110	5.800	44.000
		63			252	21,5	137	12.000	70.000
	442	1	C-type, D-type	63	12	3900	9		
		2			12	2040	12	6,1	57
		4			20	1300	35	17,3	164
		6			25	900	56	36	340
		6,3			25	900	56	36	340
		10			42	230	25,5	165	1.450
		16			56	125	42	320	5.200
		20			70	76	39,5	450	7.000
		25			87	59	49	700	10.000
		31,5			110	52	75	1.400	15.000
		32			110	52	79	1.400	15.000
		40			140	38	94	3.200	27.000
		50			175	29	110	5.800	44.000
		63			220	21,5	137	12.000	70.000
		80			280	16	174	19.000	140.000
		100			355	12,9	220	35.000	202.000
		125			473	11,9	317	49.000	220.000
	537	2	C-type, D-type	63	12	2040	12	6,1	57
		4			20	1300	35	17,3	164
		6			25	900	56	36	340
		6,3			25	900	56	36	340
		10			42	230	25,5	165	1.450
		16			56	125	42	320	5.200
		20			70	76	39,5	450	7.000
		25			87	59	49	700	10.000
		31,5			110	52	75	1.400	15.000
		32			110	52	79	1.400	15.000
		40			140	38	94	3.200	27.000
		50			175	29	110	5.800	44.000
		63			220	21,5	137	12.000	70.000
		80			280	16	174	19.000	140.000
		100			355	12,9	220	35.000	202.000
		125			473	11,9	317	49.000	220.000
		160			600	5,6	290	94.000	580.000

Transformer rated capacity	6/7,2 kV				10/12 kV				15/17.5kV				20/24 kV				30/36 kV			
	Transformer rated primary current Ip(A) at	HV Fuse-link rated current	LV Fuse-Link NH gG	LV Fuse-Link NH gTr	Transformer rated primary current Ip(A) at	HV Fuse-link rated current	LV Fuse-Link gG	LV Fuse-Link gTr	Transformer rated primary current Ip(A) at	HV Fuse-link rated current	LV Fuse-Link gG	LV Fuse-Link gTr	Transformer rated primary current Ip(A) at	HV Fuse-link rated current I_F	LV Fuse-Link gG	LV Fuse-Link gTr	Transformer rated primary current Ip(A) at	HV Fuse-link rated current I_F	LV Fuse-Link gG	LV Fuse-Link gTr
Pt (kVA)		I_{HV}				I_{HV}				I_{HVmin}				I_{HVmin}				I_{HVmin}		
	6kV	(A)	(A)	(A)	10kV	(A)	(A)	(A)	15kV	(A)	(A)	(A)	20kV	(A)	(A)	(A)	30kV	(A)	(A)	(A)
50	4,8	10	50	72	2,9	6	50	72	1,9	6	50	72	1,4	4	50	72	1.0	4	50	72
75	7,2	16	80	108	4,3	10	80	108	2,9	6	80	108	2,2	6	80	108	1,4	4	80	108
100	9,6	20	100	144	5,8	10	100	144	3,8	10	100	144	2,9	6	100	144	1,9	6	100	144
125	12,0	20	125	180	7,2	16	125	180	4,8	10	125	180	3,6	10	125	180	2,4	6	125	180
160	15,3	25	160	231	9,2	20	160	231	6,2	16	160	231	4,6	10	160	231	3,1	6	160	231
200	19,2	32	200	289	11,5	20	200	289	7,7	16	200	289	5,8	10	200	289	3,8	10	200	289
250	24,0	40	250	361	14,4	25	250	361	9,6	20	250	361	7,2	16	250	361	4,8	10	250	361
315	30,3	50	315	455	18,2	32	315	455	12,1	20	315	455	9,1	16	315	455	6,0	16	315	455
400	38,5	63	400	577	23,1	40	400	577	15,4	25	400	577	11,5	20	400	577	7,7	16	400	577
500	48,1	80	500	722	28,8	50	500	722	19,2	32	500	722	14,4	20	500	722	9,6	20	500	722
630	60,6	100	630	909	36,4	63	630	909	24,2	40	630	909	18,2	25	630	909	12,1	20	630	909
800	77,0	100	800	1.155	46,2	80	800	1.155	30,8	50	800	1.155	23,1	40	800	1.155	15,4	25	800	1.155
1000	96,2	125	1.000	1.443	57,7	80	1.000	1.443	38,5	63	1.000	1.443	28,9	50	1.000	1.443	19,2	32	1.000	1.443
1250	120,0	160	1250	**	72,2	100	1250	**	48,1	80	1250	**	36,1	63	1250	**	24,0	40	1250	**
1600	154,0	200*	1600	**	92,4	125	1600	**	61,6	100	1600	**	46,2	63	1600	**	30,8	50	1600	**
2000	192,5	250*	**	**	115,5	160	**	**	77,0	100	**	**	57,7	80	**	**	38,5	63	**	**