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

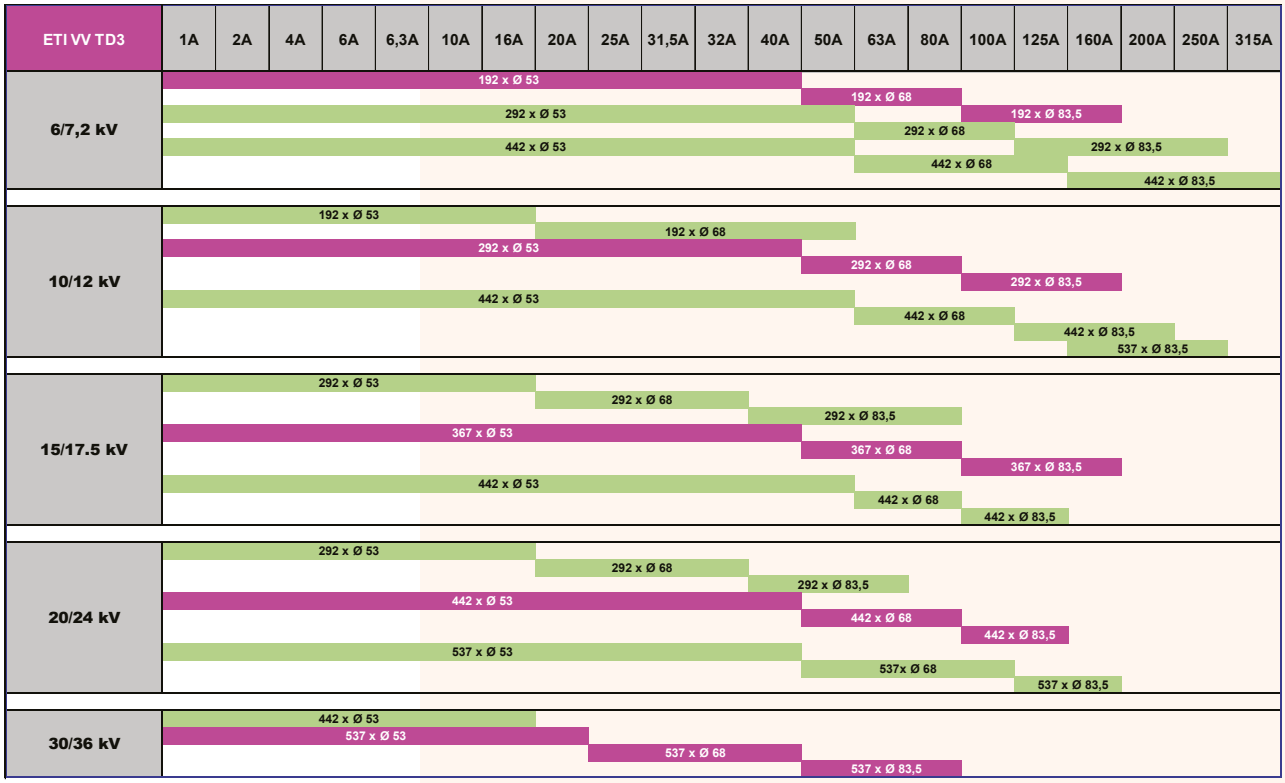
ETI HV (High-voltage Current-limiting fuse-links) named VVT TD3 are designed to protect devices in switch-gears and other equipment (distribution transformers, power capacitors, MV motors) from thermal and dynamic effects of short-circuits and over-currents. Time-current characteristics correspond to 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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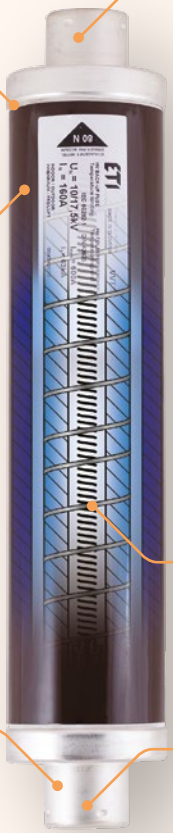
→ KEMA type test reports

→ 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*		
20/36	442	2 A		004260103	004262103		53	2.3
		4 A		004260104	004262104			
		6 A		004260105	004262105			
		6,3 A		004260106	004262106			
		10 A		004260107	004262107			
		16 A		004260108	004262108			
		20 A		004260109	004262109			
		25 A		004260110	004262110			
	537	1 A	004261102				53	2.8
		2 A	004261103	004260003	004262003	004262033		
		4 A	004261104	004260004	004262004	004262034		
		6 A	004261105	004260005	004262005	004262035		
		6,3 A	004261106	004260006	004262006	004262036		
		10 A	004261107	004260007	004262007	004262037		
		16 A	004261108	004260008	004262008	004262038		
		20 A	004261109	004260009	004262009	004262039		
		25 A	004261110	004260010	004262010	004262040	68	4.7
		31,5 A	004261111	004260011	004262011	004262041		
		32 A	004261112	004260012	004262012	004262042		
		40 A	004261113	004260013	004262013	004262043		
		50 A	004261114	004260014	004262014	004262044	83,5	7.0
		63 A	004261115	004260015	004262015	004262045		
		80 A	004261116	004260016	004262016	004262046		

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

High voltage fuse-links for liquid-immersed transformers

Ordering Code Numbers

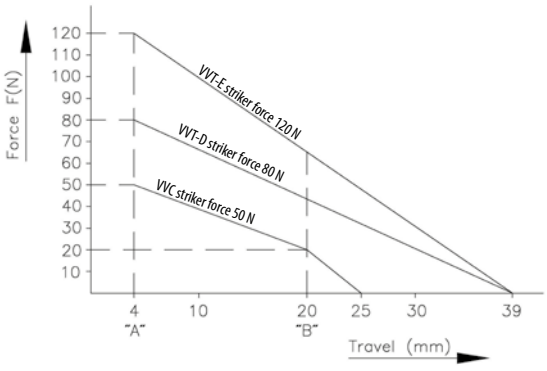
rated voltage U_n [kV]	Dimension "e" according to DIN and IEC (mm)	rated current [A]	VVT-D Striker type 80N	Tube diameter "d" (mm)	weight [kg]
6/12	292	2A	004236903	53	1,6
		4A	004236904		
		6A	004236905		
		10A	004236906		
		16A	004236907		
		20A	004236908		
		25A	004236909		
		32A	004236910		
		40A	004236911		
10/24	292	2A	004256943	53	1,6
		4A	004256944		
		6A	004256945		
		10A	004256946		
		16A	004256947		
	442	2A	004256903	53	2,3
		4A	004256904		
		6A	004256905		
		10A	004256906		
		16A	004256907		
		20A	004256908		
		25A	004256909		
		32A	004256910		
		40A	004256911		

Technical data on page 903, 907

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 $[A^2s]$
20/36	442	2	C-type, D-type	20	12	2900	17	6,1	57
		4			20	1870	45	17,3	164
		6			27	1300	73	36	340
		6,3			27	1300	73	36	340
		10			42	323	40	165	1.450
		16			64	177	60	320	5.200
		20			80	110	70	450	7.000
		25			100	83	80	700	10.000
	537	1	C-type, D-type	31,5	12	5800	14		
		2			12	2900	17	6,1	57
		4			20	1870	45	17,3	164
		6			25	1300	73	36	340
		6,3			25	1300	73	36	340
		10			42	323	40	165	1.450
		16			56	177	60	320	5.200
		20			70	110	70	450	7.000
		25			87	83	80	700	10.000
		31,5			110	75	115	1.400	15.000
		32			110	75	120	1.400	15.000
		40			140	53	145	3.200	27.000
		50			175	41	150	5.800	44.000
		63			220	30	195	12.000	70.000
		80			280	22,5	230	19.000	140.000

Force / travel striker pin diagram



Connection in indoor switchgear, example:

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**	**	**