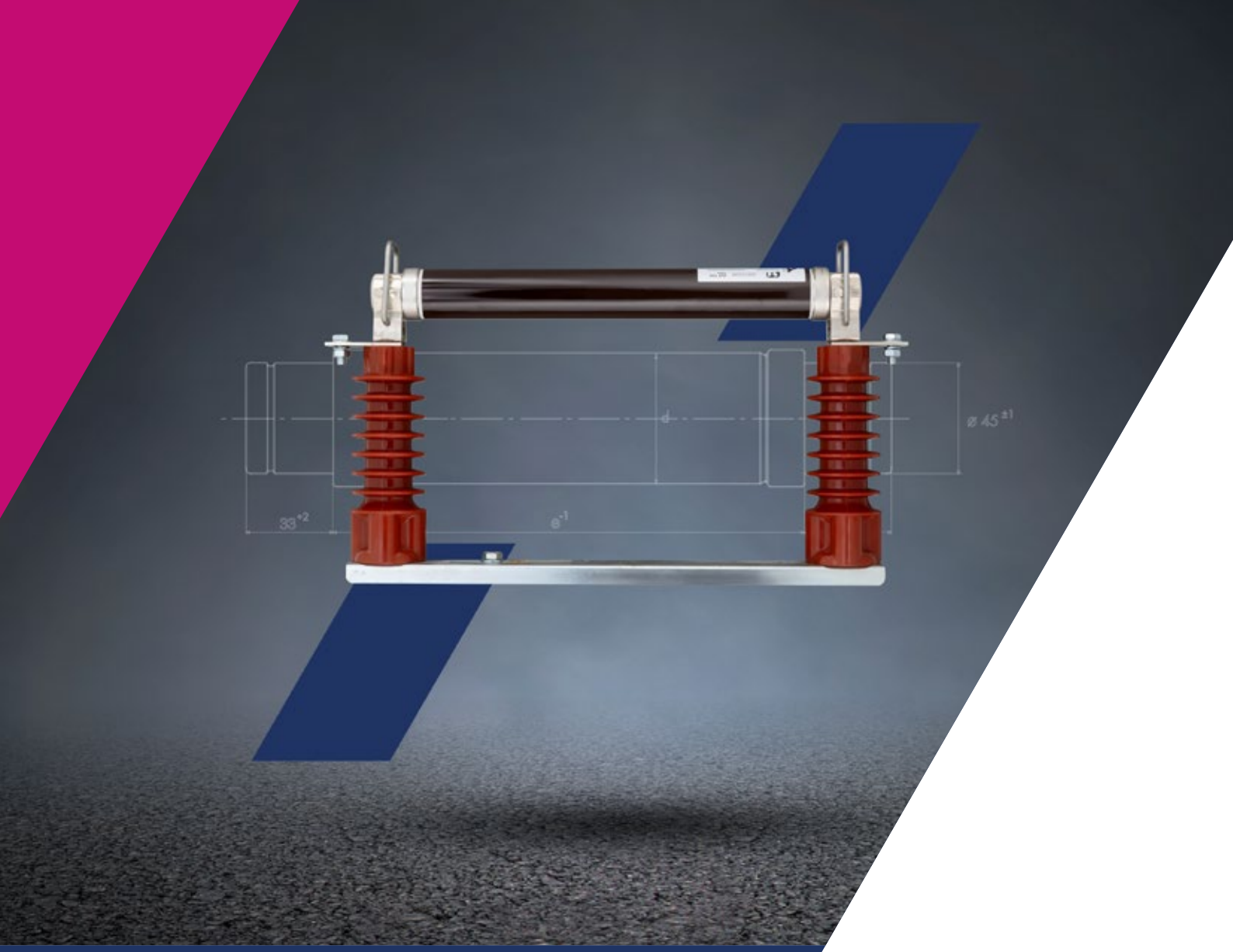


VV/HH

High Voltage Fuses

High Voltage Fuse-Links **1128**

Fuse Bases **1149**

KEMA Labs

/etigroup

ETI
SWITCH TO
A SAFE FUTURE

VV High Voltage Fuse-Links

High voltage high-breaking capacity fuse-links

General information

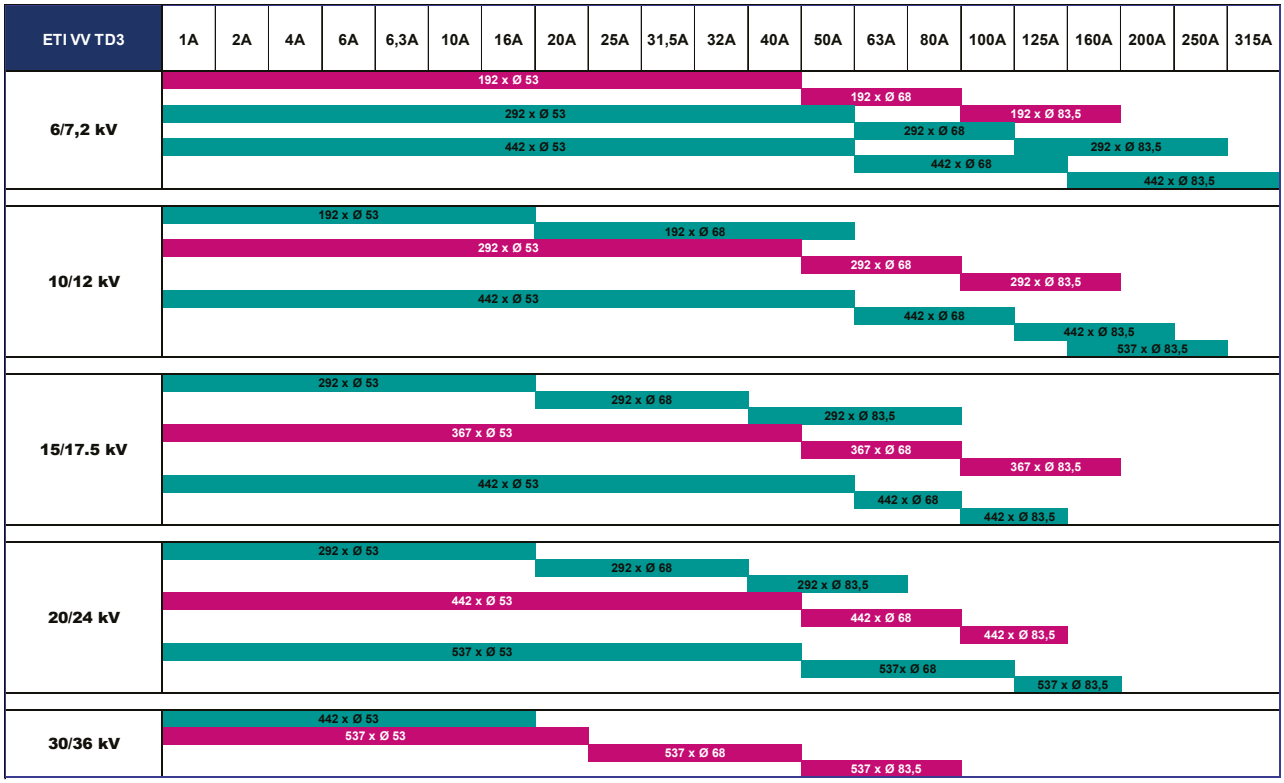
ETI HV (High-voltage Current-limiting fuse-links) named VVT TD3 are designed to protect devices in switch-gears and other equipment (distribution transformers, power capacitors, MV motors) from thermal and dynamic effects of short-circuits and over-currents. Time-current characteristics correspond to 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
- High endurance ceramic tube
- Low temperature rise because of low power dissipation
- Low minimum breaking currents
- Low switching voltages
- High breaking capacity 63 kA
- Galvanically protected contact caps made of electrolytic copper can be nickel (Ni), tin (Sn) or silver (Ag) plated

- Reliable sealing system against humidity irruption

- 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...)
- Silver melting element
- 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)	kg
					Ni plated contacts	Ag plated contacts*		
3/7.2	192	1 A	004221102				53	1.1
		2 A	004221103	004220003	004222003	004222033		
		4 A	004221104	004220004	004222004	004222034		
		6 A	004221105	004220005	004222005	004222035		
		6,3 A	004221106	004220006	004222006	004222036		
		10 A	004221107	004220007	004222007	004222037		
		16 A	004221108	004220008	004222008	004222038		
		20 A	004221109	004220009	004222009	004222039		
		25 A	004221110	004220010	004222010	004222040		
		31,5 A	004221111	004220011	004222011	004222041		
		32 A	004221112	004220012	004222012	004222042		
		40 A	004221113	004220013	004222013	004222043		
		50A	004221114	004220014	004222014	004222044	68	1.7
		63 A	004221115	004220015	004222015	004222045		
		80 A	004221116	004220016	004222016	004222046		
		100 A	004221117	004220017	004222017	004222047	83,5	2.7
		125 A	004221118	004220018	004222018	004222048		
		160 A	004221119	004220019	004222019	004222049		
	292	2 A		004220503	004222503		53	1.6
		4 A		004220504	004222504			
		6 A		004220505	004222505			
		6,3 A		004220506	004222506			
		10 A		004220507	004222507			
		16 A		004220508	004222508			
		20 A		004220509	004222509			
		25 A		004220510	004222510			
		31,5 A		004220511	004222511			
		32 A		004220512	004222512			
		40 A		004220513	004222513			
		50 A		004220514	004222514			
		63 A		004220515	004222515		68	2.8
		80 A		004220516	004222516			
		100 A		004220517	004222517			
		125 A		004220518	004222518		83,5	4.0
		160 A		004220519	004222519			
		200 A		004220520	004222520			
		250 A		004220521	004222521			
	442	2 A		004220603	004222603		68	3.9
		4 A		004220604	004222604			
		6 A		004220605	004222605			
		6,3 A		004220606	004222606			
		10 A		004220607	004222607			
		16 A		004220608	004222608			
		20 A		004220609	004222609			
		25 A		004220610	004222610			
		31,5 A		004220611	004222611			
		32 A		004220612	004222612			
		40 A		004220613	004222613			
		50 A		004220614	004222614			
		63 A		004220615	004222615			
		80 A		004220616	004222616			
		100 A		004220617	004222617			
		125 A		004220618	004222618			
		160 A		004220619	004222619		83,5	5.8
		200 A		004220620	004222620			
		250 A		004220621	004222621			
		315 A		004220622	004222622			

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

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]
3/7.2	192	1	C, D	63	12	1170	3		
		2			12	580	4	6,1	57
		4			20	370	9	17,3	164
		6			25	250	10	36	340
		6,3			25	250	10	36	340
		10			43	76	9	165	1.450
		16			56	44	14	320	5.200
		20			70	27	12,5	450	7.000
		25			87	21	16	700	10.000
		31,5			110	18,5	23,5	1.400	15.000
		32			110	18,5	25	1.400	15.000
		40			140	13,7	28,5	3.200	27.000
		50			175	10,5	35,5	5.800	44.000
		63			220	7,5	42,5	12.000	70.000
		80			280	5,9	59	19.000	140.000
		100			360	4,8	73	35.000	202.000
		125			450	3,9	101	55.000	300.000
		160			600	3	144	94.000	580.000
	292	2	C, D	63	12	580	4	6,1	57
		4			20	370	9	17,3	164
		6			25	250	10	36	340
		6,3			25	250	10	36	340
		10			43	76	9	165	1.450
		16			56	44	14	320	5.200
		20			70	27	12,5	450	7.000
		25			87	21	16	700	10.000
		31,5			110	18,5	23,5	1.400	15.000
		32			110	18,5	25	1.400	15.000
		40			140	13,7	28,5	3.200	27.000
		50			175	10,5	35,5	5.800	44.000
		63			220	7,5	42,5	12.000	70.000
		80			280	5,9	59	19.000	140.000
		100			360	4,8	73	35.000	202.000
		125			450	3,9	101	55.000	300.000
		160			600	3	144	94.000	580.000
		200			1000	2,2	155	151.780	789.270
		250			1250	1,8	196	228.610	1.188.800
	442	2	C, D	63	12	840	4,7	6,1	57
		4			20	530	11,7	17,3	164
		6			25	270	13,4	36	340
		6,3			25	270	13,4	36	340
		10			43	90	11	165	1.450
		16			56	53	16	320	5.200
		20			70	32	15	450	7.000
		25			87	25	19	700	10.000
		31,5			110	21,5	28	1.400	15.000
		32			110	21,5	30	1.400	15.000
		40			140	15,5	34	3.200	27.000
		50			175	12,6	43	5.800	44.000
		63			220	9	51	12.000	70.000
		80			280	7,1	71	19.000	140.000
		100			360	5,8	88	35.000	202.000
		125			450	4,7	121	55.000	300.000
		160			600	3,6	173	94.000	580.000
		200			1000	2,65	195	151.780	789.270
		250			1250	2,2	253	228.610	1.188.800
		315			1575	1,75	320	368.640	1.916.930

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)	kg
					Ni plated contacts	Ag plated contacts*		
6/12	192	2 A		004230103	004232103		53	1.1
		4 A		004230104	004232104			
		6 A		004230105	004232105			
		6,3 A		004230106	004232106			
		10 A		004230107	004232107			
		16 A		004230108	004232108			
		20 A		004230109	004232109		68	1.7
		25 A		004230110	004232110			
		31,5 A		004230111	004232111			
		32 A		004230112	004232112			
		40 A		004230113	004232113			
		50 A		004230114	004232114			
	292	1 A	004231102				53	1.6
		2 A	004231103	004230003	004232003	004232033		
		4 A	004231104	004230004	004232004	004232034		
		6 A	004231105	004230005	004232005	004232035		
		6,3 A	004231106	004230006	004232006	004232036		
		10 A	004231107	004230007	004232007	004232037		
		16 A	004231108	004230008	004232008	004232038		
		20 A	004231109	004230009	004232009	004232039		
		25 A	004231110	004230010	004232010	004232040		
		31,5 A	004231111	004230011	004232011	004232041		
		32 A	004231112	004230012	004232012	004232042		
		40 A	004231113	004230013	004232013	004232043		
		50 A	004231114	004230014	004232014	004232044	68	2.8
		63 A	004231115	004230015	004232015	004232045		
		80 A	004231116	004230016	004232016	004232046		
		100 A	004231117	004230017	004232017	004232047	83,5	4.0
		125 A	004231118	004230018	004232018	004232048		
		160 A	004231119	004230019	004232019	004232049		
	442	2 A		004230503	004232503		53	2.3
		4 A		004230504	004232504			
		6 A		004230505	004232505			
		6,3 A		004230506	004232506			
		10 A		004230507	004232507			
		16 A		004230508	004232508			
		20 A		004230509	004232509			
		25 A		004230510	004232510			
		31,5 A		004230511	004232511			
		32 A		004230512	004232512			
		40 A		004230513	004232513			
		50 A		004230514	004232514			
		63 A		004230515	004232515		68	3.9
		80 A		004230516	004232516			
		100 A		004230517	004232517			
		125 A		004230518	004232518		83,5	5.8
		160 A		004230519	004232519			
		200 A		004230520	004232520			
	537	160 A		004230619	004232619		83,5	7.0
		200 A		004230620	004232620			
		250 A		004230621	004232621			

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

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]
6/12	192	2	C, D	50	12	980	6	6,1	57
		4			20	650	15	17,3	164
		6			27	435	21	36	340
		6,3			27	435	21	36	340
		10			42	130	15	165	1.450
		16			64	70	24	320	5.200
		20			80	44	21	450	7.000
		25			100	33	28	700	10.000
		31,5			126	29	40	1.400	15.000
		32			126	29	43	1.400	15.000
		40			160	21	48	3.200	27.000
		50			200	16,5	58	5.800	44.000
	292	1	C, D	63	12	1970	5		
		2			12	980	6	6,1	57
		4			20	650	15	17,3	164
		6			25	435	21	36	340
		6,3			25	435	21	36	340
		10			43	130	15	165	1.450
		16			56	70	24	320	5.200
		20			70	44	21	450	7.000
		25			87	33	28	700	10.000
		31,5			110	29	40	1.400	15.000
		32			110	29	43	1.400	15.000
		40			140	21	48	3.200	27.000
		50			175	16,5	58	5.800	44.000
		63			220	12	74	12.000	70.000
		80			280	9	96	19.000	140.000
		100			360	6,7	105	35.000	202.000
		125			450	5,2	138	55.000	300.000
		160			600	4,1	190	94.000	580.000
	442	2	C, D	63	12	980	6	6,1	57
		4			20	650	15	17,3	164
		6			25	435	21	36	340
		6,3			25	435	21	36	340
		10			43	130	15	165	1.450
		16			56	70	24	320	5.200
		20			70	44	21	450	7.000
		25			87	33	28	700	10.000
		31,5			110	29	40	1.400	15.000
		32			110	29	43	1.400	15.000
		40			140	21,5	48	3.200	27.000
		50			175	16,5	58	5.800	44.000
		63			220	12	74	12.000	70.000
		80			280	9	96	19.000	140.000
		100			360	6,7	105	35.000	202.000
		125			450	5,2	138	55.000	300.000
		160			600	4,1	190	94.000	580.000
		200			1000	3,4	238	151.780	789.270
	537	160	C, D	63	600	4,1	179	94.000	580.000
		200			1000	3,4	238	151.780	789.270
		250			1250	2,8	305	228.610	1.188.800

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 Ni plated contacts	VVT-D3 Striker type 80N THERMO Ag plated contacts*	Tube diameter "d" (mm)	kg
10/17,5	292	2 A		004240103	004242103		53	1.6
		4 A		004240104	004242104			
		6 A		004240105	004242105			
		6,3 A		004240106	004242106			
		10 A		004240107	004242107			
		16 A		004240108	004242108			
		20 A		004240109	004242109		68	2.8
		25 A		004240110	004242110			
		31,5 A		004240111	004242111			
		32 A		004240112	004242112			
		40 A		004240113	004242113		83,5	4.0
		50A		004240114	004242114			
		63 A		004240115	004242115			
		80 A		004240116	004242116			
		100 A		004240117	004242117			
	367	1 A	004241102				53	1.9
		2 A	004241103	004240003	004242003	004242033		
		4 A	004241104	004240004	004242004	004242034		
		6 A	004241105	004240005	004242005	004242035		
		6,3 A	004241106	004240006	004242006	004242036		
		10 A	004241107	004240007	004242007	004242037		
		16 A	004241108	004240008	004242008	004242038		
		20 A	004241109	004240009	004242009	004242039		
		25 A	004241110	004240010	004242010	004242040		
		31,5 A	004241111	004240011	004242011	004242041		
		32 A	004241112	004240012	004242012	004242042		
		40 A	004241113	004240013	004242013	004242043		
		50 A	004241114	004240014	004242014	004242044	68	3.1
		63 A	004241115	004240015	004242015	004242045		
		80A	004241116	004240016	004242016	004242046		
		100 A	004241117	004240017	004242017	004242047	83,5	4.6
		125A	004241118	004240018	004242018	004242048		
		160 A	004241119	004240019	004242019	004242049		
	442	2 A		004240503	004242503		53	2.3
		4 A		004240504	004242504			
		6 A		004240505	004242505			
		6,3 A		004240506	004242506			
		10 A		004240507	004242507			
		16 A		004240508	004242508			
		20 A		004240509	004242509			
		25 A		004240510	004242510			
		31,5 A		004240511	004242511			
		32 A		004240512	004242512			
		40 A		004240513	004242513			
		50 A		004240514	004242514			
		63 A		004240515	004242515		68	3.9
		80A		004240516	004242516			
		100 A		004240517	004242517		83,5	5.8
		125 A		004240518	004242518			

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

WATCH THE VIDEO

How to select the suitable HV fuse-links using the FuseSpline tool

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]
10/17.5	292	2	C, D	50	12	1400	8	6,1	57
		4			20	920	17	17,3	164
		6			27	610	35	36	340
		6,3			27	610	35	36	340
		10			42	160	20	165	1.450
		16			64	98	31	320	5.200
		20			80	60	29	450	7.000
		25			100	46	36	700	10.000
		31,5			126	41	51	1.400	15.000
		32			126	41	53	1.400	15.000
		40			160	30	64	3.200	27.000
		50			200	23	75	5.800	44.000
		63			252	16,5	100	12.000	70.000
		80			320	12,5	130	19.000	140.000
		100			400	9,5	150	35.000	202.000
	367	1	C, D	63	12	2800	6		
		2			12	1400	8	6,1	57
		4			20	920	17	17,3	164
		6			25	610	35	36	340
		6,3			25	610	35	36	340
		10			42	160	20	165	1.450
		16			56	98	31	320	5.200
		20			70	60	29	450	7.000
		25			87	46	36	700	10.000
		31,5			110	41	51	1.400	15.000
		32			110	41	53	1.400	15.000
		40			140	30	64	3.200	27.000
		50			175	23	75	5.800	44.000
		63			220	16,5	100	12.000	70.000
		80			280	12,5	130	19.000	140.000
		100			360	9,5	150	35.000	202.000
		125			450	7,6	210	55.000	300.000
		160			600	5,9	290	94.000	580.000
	442	2	C, D	63	12	1400	8	6,1	57
		4			20	920	17	17,3	164
		6			25	610	35	36	340
		6,3			25	610	35	36	340
		10			42	160	20	165	1.450
		16			56	98	31	320	5.200
		20			70	60	29	450	7.000
		25			87	46	36	700	10.000
		31,5			110	41	51	1.400	15.000
		32			110	41	53	1.400	15.000
		40			140	30	64	3.200	27.000
		50			175	23	75	5.800	44.000
		63			220	16,5	100	12.000	70.000
		80			280	12,5	130	19.000	140.000
		100			360	9,5	150	35.000	202.000
		125			450	7,6	210	55.000	300.000

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)	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

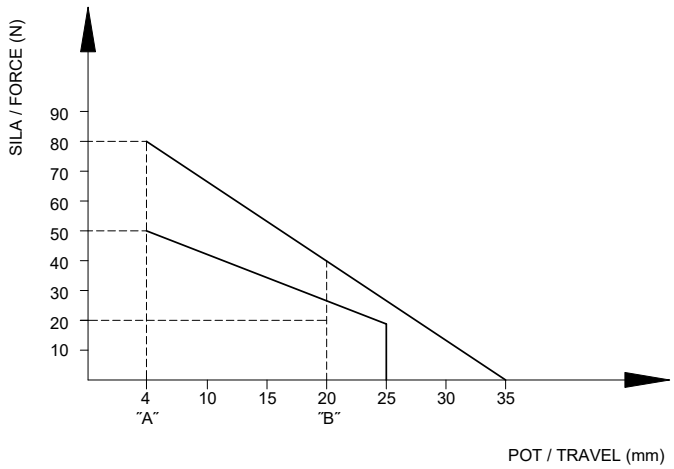
Rated voltage [kV]	Dimension "e" according to DIN and IEC [mm]	Rated current I_n [A]	Striker type	Rated breaking capacity [kA]	Rated minimum breaking current [A]	Cold resistance [mΩ]	Power dissipation [W]	Pre-arcing I^2t value $[A^2s]$	Total I^2t value $[A^2s]$
10/24	292	2	C, D	31,5	12	2040	12	6,1	57
		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	79	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, D	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	365	49.000	220.000
	537	2	C, D	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	365	49.000	220.000
		160			600	8,8	290	94.000	580.000

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)	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

Force / travel striker pin diagram



Connection in indoor switchgear, example:

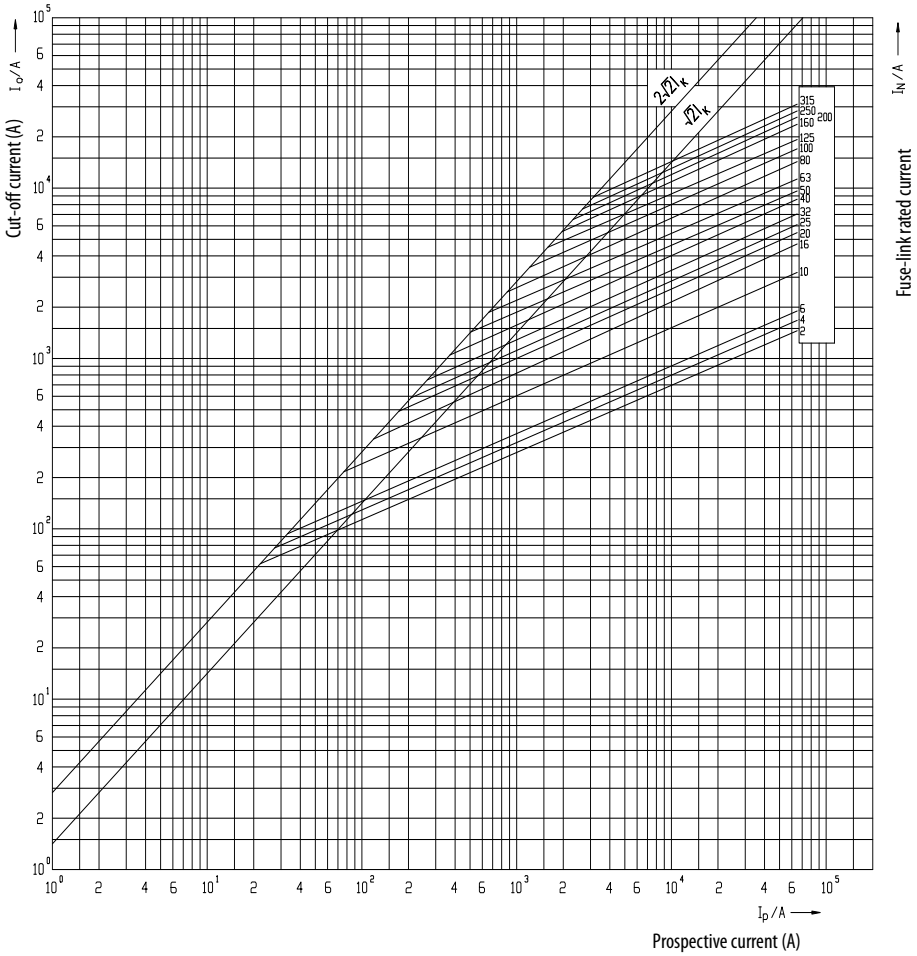
How to avoid wrong HV fuse-link selection

WATCH THE VIDEO

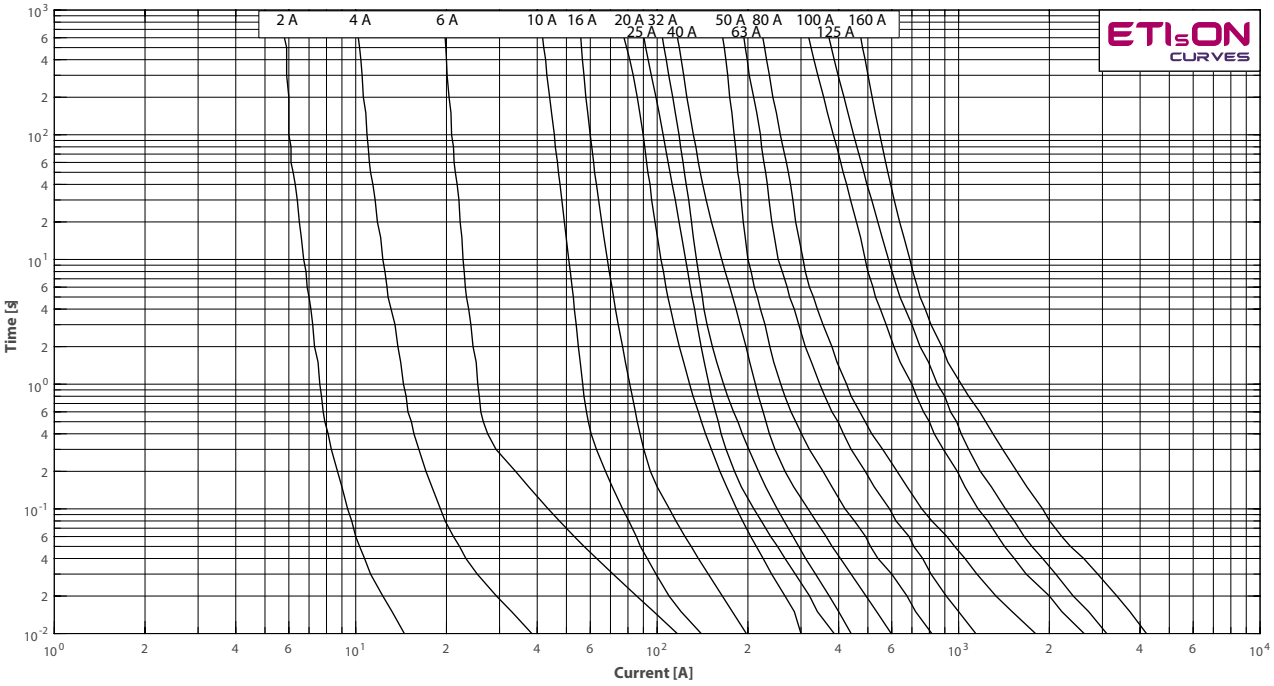
Technical data

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, D	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	320	40	165	1.450
		16			64	185	60	320	5.200
		20			84	110	58	450	7.000
		25			100	85	80	700	10.000
	537	1	C, D	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			45	320	40	165	1.450
		16			56	185	60	320	5.200
		20			84	110	58	450	7.000
		25			87	90	77	700	10.000
		31,5			116	75	115	1.400	15.000
		32			116	75	120	1.400	15.000
		40			149	57	145	3.200	27.000
		50			175	47	145	5.800	44.000
		63			220	34	200	12.000	70.000
		80			280	25,5	270	19.000	140.000

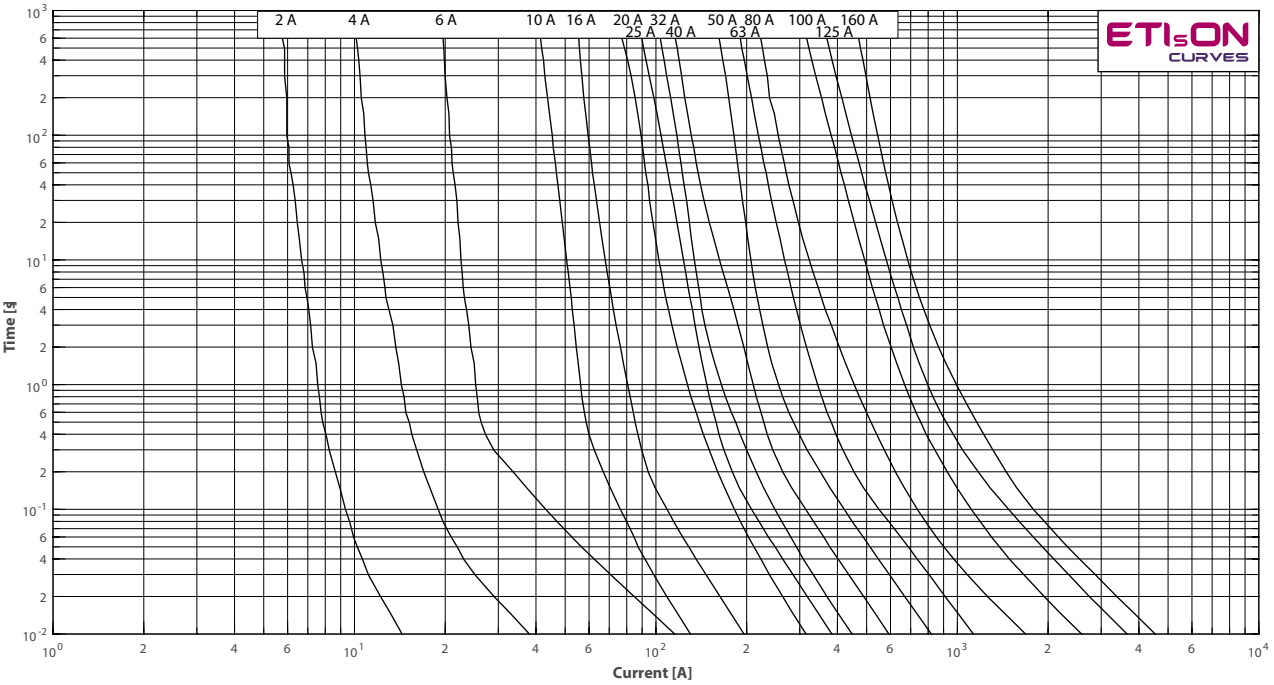
Cut-off current diagram for VV-Thermo fuse links



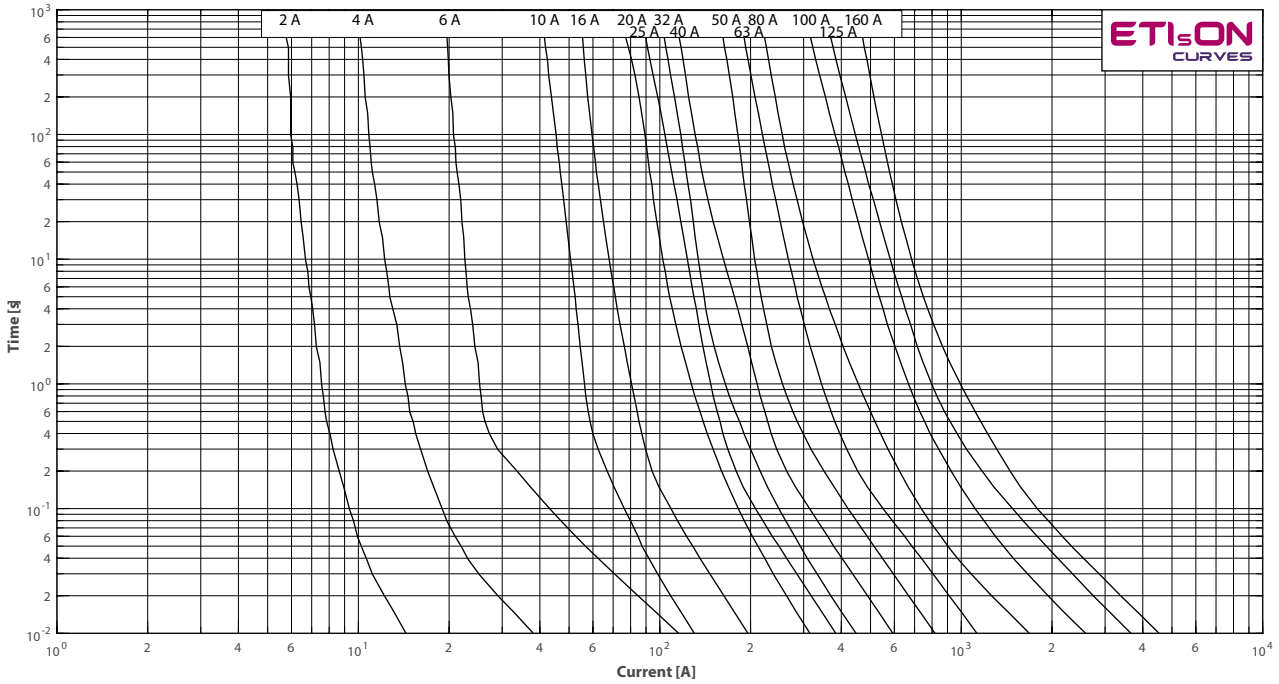
Time-current characteristics for VV-thermo fuse links - 7,2 kV



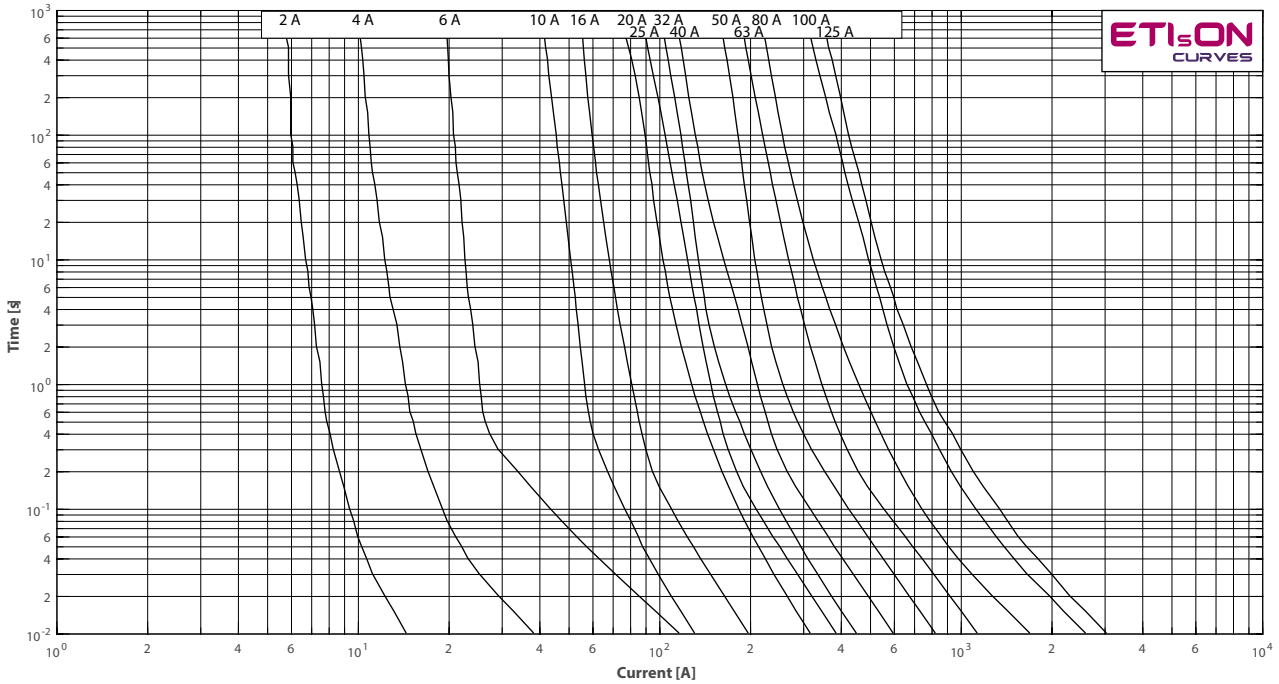
Time-current characteristics for VV-thermo fuse links - 12 kV



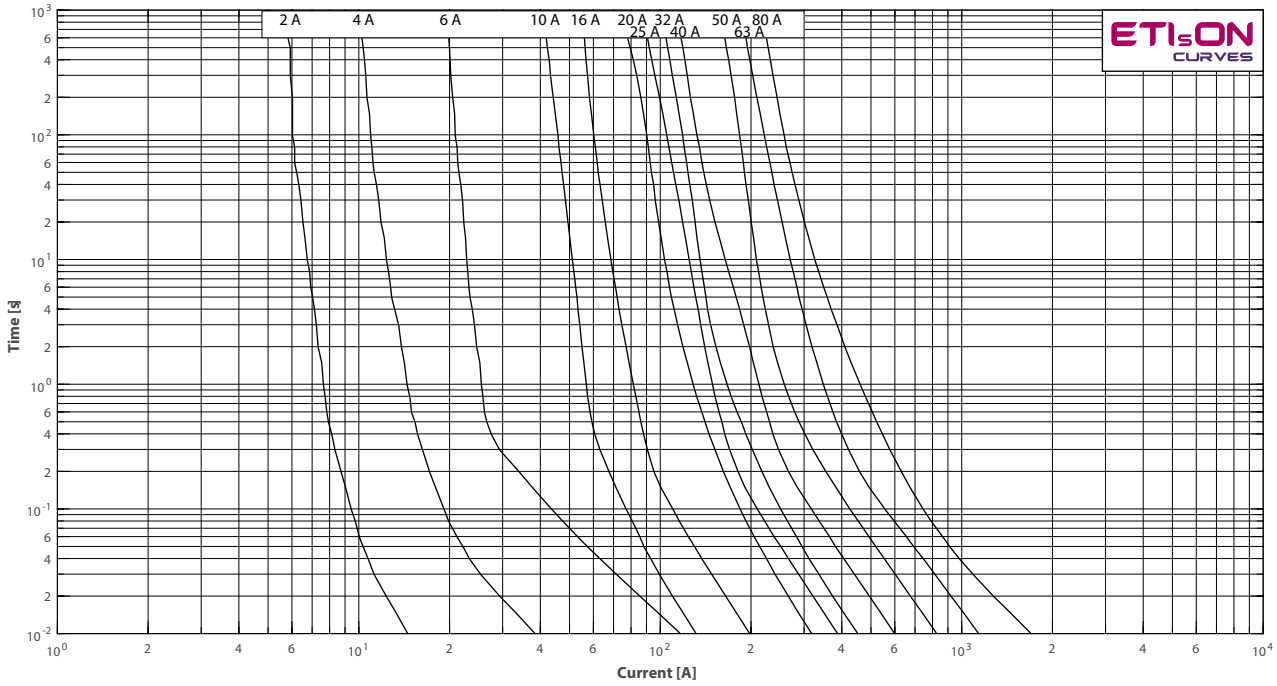
Time-current characteristics for VV-thermo fuse links - 17,5 kV



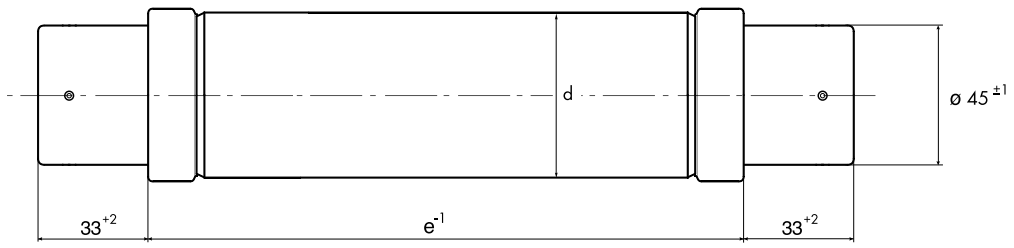
Time-current characteristics for VV-thermo fuse links - 24 kV



Time-current characteristics for VV-thermo fuse links - 36 kV



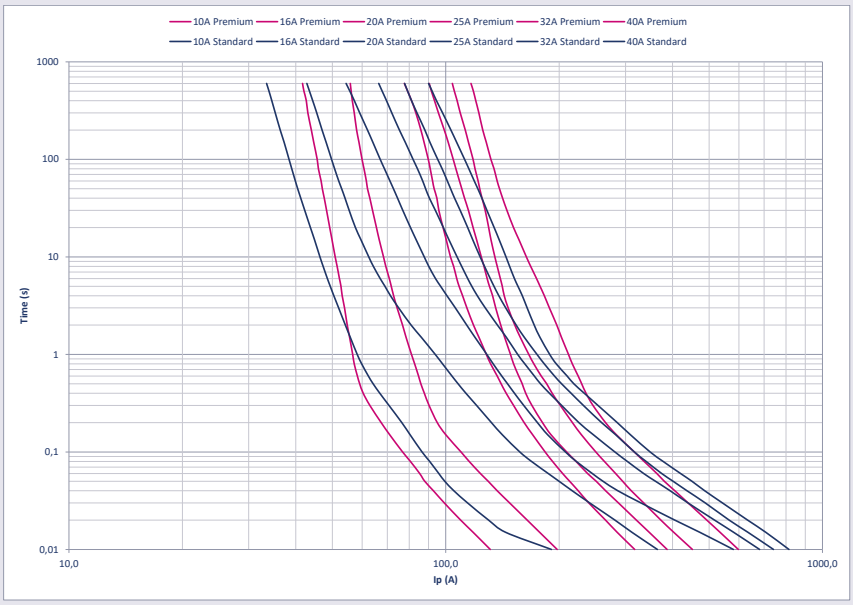
Dimensions



High voltage standard fuse-links

ETI VV standard (STD) fuse-links are intended for the protection of medium-voltage distribution transformers and associated equipment against short-circuit currents.
The range covers the most commonly used transformer protection applications. Time-current characteristics are designed to withstand transformer energization currents while ensuring reliable fault-current interruption within the specified operating range. The fuse-links comply with the relevant IEC requirements for current-limiting fuse-links.

Comparison of high-breaking capacity (premium) and standard fuse-links
The VV standard range covers the most frequently encountered transformer protection applications. For installations requiring increased application flexibility, enhanced operating margins or protection of larger transformer ratings, the VV high-breaking capacity (premium) range provides an extended performance envelope.



Example of transformer protection
The rated currents of the VV premium and the VV standard product ranges are comparable. The VV standard product range can be a direct alternative to the VV premium ones. The compatibility is shown in the example below:

Example of 315kVA 10kV power transformer, u_k=4%.

Calculation of I_{nt} at rated voltage:

$$I_{nt} = \frac{P_n(kVA)}{\sqrt{3}U_n(kV)} = \frac{315kVA}{\sqrt{3}\times 10} = 18{,}2A$$

Calculation of I_{inrush} current:

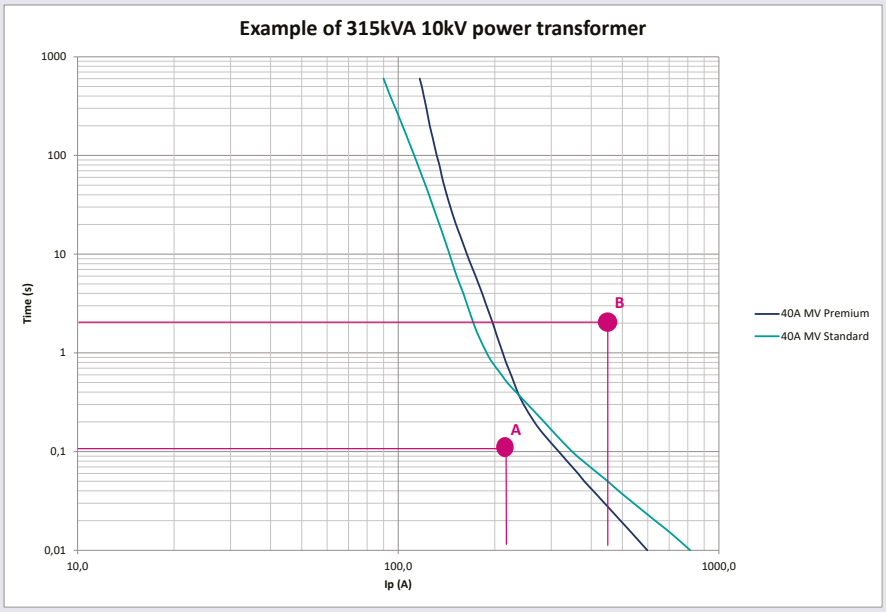
$$I_{inrush} = I_{nt} \times 12 = 218{,}4A$$

Calculation of I_{sc} current:

$$I_{sc} = \frac{I_{nt}}{u_k} = \frac{18{,}2A}{0{,}04} = 455A$$

Determination of point A at I_{inrush} and 0,1s

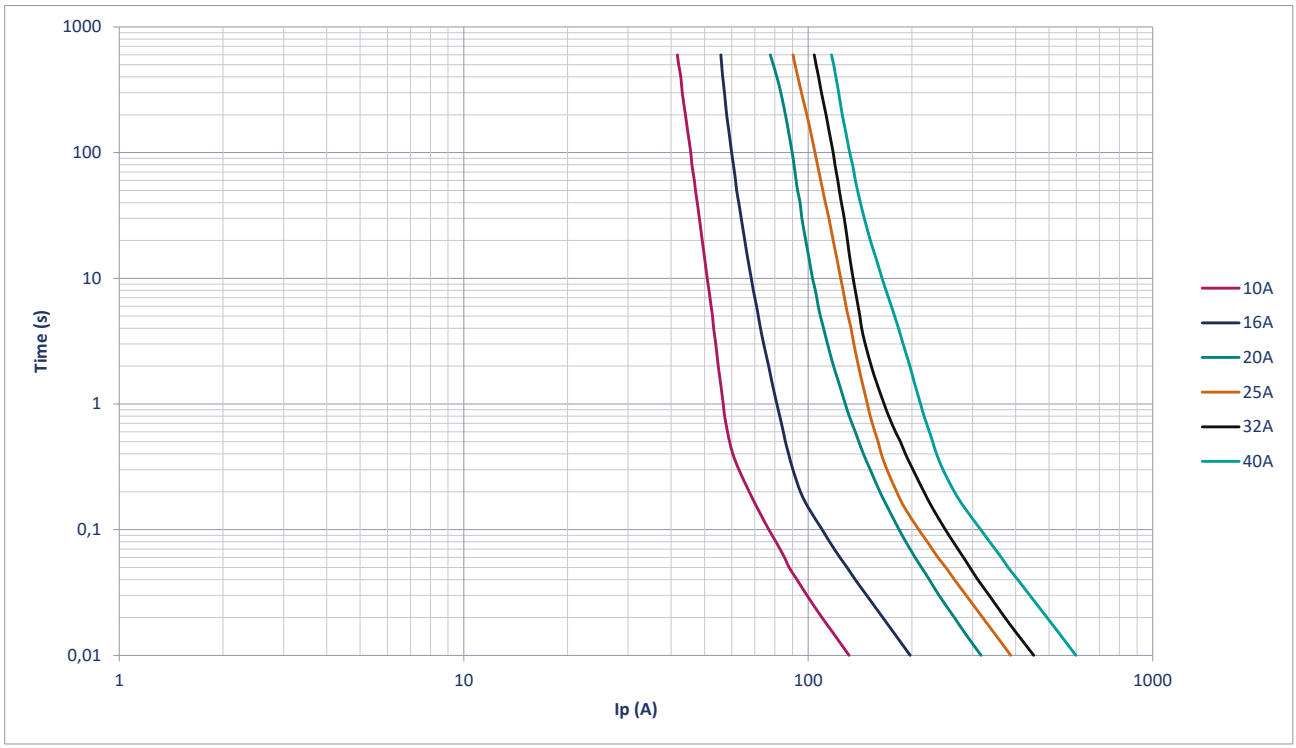
Determination of point B at I_{sc} and 2s



Ordering Code Numbers

rated voltage U_n [kV]	Dimension "e" according to DIN and IEC (mm)	rated current [A]	VVC3 STD Striker type 50N	VVT-D3 STD Striker type 80N THERMO	Tube diameter "d" (mm)	kg
6/12	292	16 A	004230068	004232068	53	1,6
		20 A	004230069	004232069		
		25 A	004230070	004232070		
		31,5 A	004230071	004232071		
		32 A	004230072	004232072		
		40 A	004230073	004232073		
10/17,5	367	16 A	004240068	004242068	53	1,9
		20 A	004240069	004242069		
		25 A	004240070	004242070		
		31,5 A	004240071	004242071		
		32 A	004240072	004242072		
		40 A	004240073	004242073		
10/24	442	16 A	004250068	004252068	53	2,3
		20 A	004250069	004252069		
		25 A	004250070	004252070		
		31,5 A	004250071	004252071		
		32 A	004250072	004252072		
		40 A	004250073	004252073		

Time-current characteristics for VV STD fuse links - 24 kV



Technical data

Rated voltage	Dimension "e" according to DIN and IEC	Rated current	Striker type	Rated breaking capacity	Rated minimum breaking current	Cold resistance	Power dissipation	Pre-arcing I^2t value	Total I^2t value
[kV]	[mm]	I_n [A]		[kA]	[A]	[mΩ]	[W]	[A^2s]	[A^2s]
6/12	292	10	C, D	63	41	108	13	270	1.260
		16			65	72	24,5	740	3.500
		20			80	41	20,5	1.800	8.600
		25			100	32	26	2.900	12.500
		31,5			126	26	36,5	4.400	17.200
		32			126	26	37,5	4.400	17.200
		40			160	24	62	5.500	22.200
10/17,5	367	10	C, D	63	44	154	18	270	1.260
		16			67	102	34	740	3.500
		20			80	58	28	1.800	8.600
		25			100	45	36	2.900	12.500
		31,5			126	37	51	4.400	17.200
		32			126	37	53	4.400	17.200
		40			160	34	87	5.500	22.200
10/24	442	10	C, D	63	44	201	24,5	270	1.260
		16			67	134	46	740	3.500
		20			80	76	40	1.800	8.600
		25			100	59	50	2.900	12.500
		31,5			126	49	71	4.400	17.200
		32			126	49	72	4.400	17.200
		40			160	45	122	5.500	22.200

Comparison of high-breaking capacity (premium) and standard fuse-links

Rated voltage	Rated current	Rated minimum breaking current [A]		Cold resistance [mΩ]		Power dissipation [W]		Pre-arcing I^2t value [A^2s]		Total I^2t value [A^2s]	
[kV]	I_n [A]	VV TD3	VV STD	VV TD3	VV STD	VV TD3	VV STD	VV TD3	VV STD	VV TD3	VV STD
6/12	10	43	41	130	108	15	13	165	270	1.450	1.260
	16	56	65	70	72	24	24,5	320	740	5.200	3.500
	20	70	80	44	41	21	20,5	450	1.800	7.000	8.600
	25	87	100	33	32	28	26	700	2.900	10.000	12.500
	31,5	110	126	29	26	40	36,5	1.400	4.400	15.000	17.200
	32	110	126	29	26	43	37,5	1.400	4.400	15.000	17.200
	40	140	160	21	24	48	62	3.200	5.500	27.000	22.200
10/17,5	10	42	44	160	154	20	18	165	270	1.450	1.260
	16	56	67	95	102	31	34	320	740	5.200	3.500
	20	70	80	58	58	29	28	450	1.800	7.000	8.600
	25	87	100	45	45	36	36	700	2.900	10.000	12.500
	31,5	110	126	38	37	51	51	1.400	4.400	15.000	17.200
	32	110	126	38	37	53	53	1.400	4.400	15.000	17.200
	40	140	160	28	34	64	87	3.200	5.500	27.000	22.200
10/24	10	42	44	230	201	25,5	24,5	165	270	1.450	1.260
	16	56	67	125	134	42	46	320	740	5.200	3.500
	20	70	80	76	76	39,5	40	450	1.800	7.000	8.600
	25	87	100	59	59	49	50	700	2.900	10.000	12.500
	31,5	110	126	52	49	75	71	1.400	4.400	15.000	17.200
	32	110	126	52	49	79	72	1.400	4.400	15.000	17.200
	40	140	160	38	45	94	122	3.200	5.500	27.000	22.200

High voltage fuse-links for liquid-immersed transformers

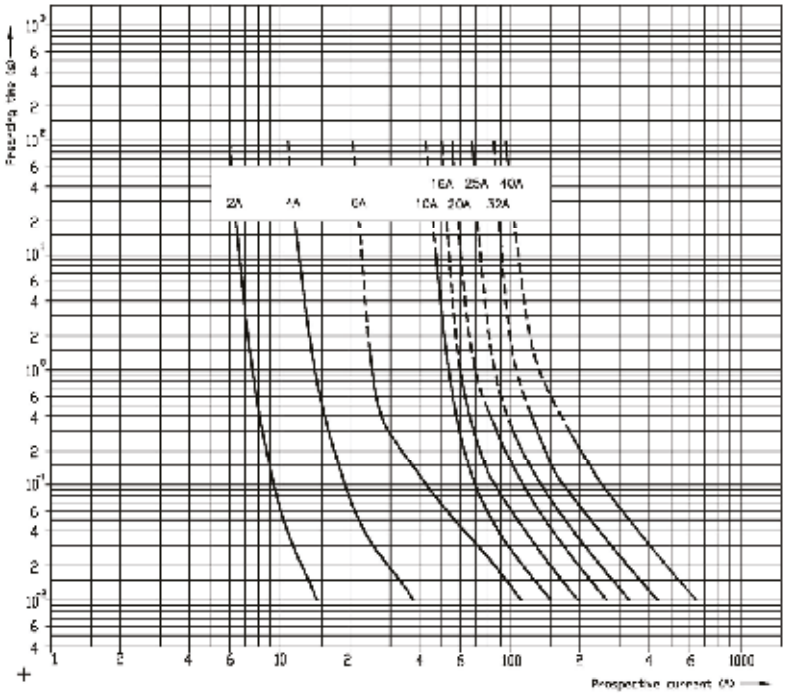
Ordering Code Numbers

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)	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		

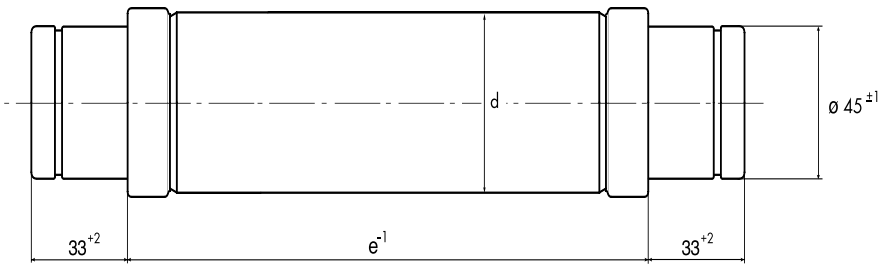
Technical data

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 $[A^2s]$
6/12	292	2A	VVT-D	50	12	980	6	6,1	57
		4A			20	650	15	17,3	164
		6A			25	435	21	36	340
		10A			46	87	8	161	1530
		16A			60	60,5	19	250	2270
		20A			80	47	22	430	3750
		25A			105	37	34	650	5500
		32A			130	27	43	1220	10100
		40A			178	21	54	2270	18100
	292	2A	VVT-D	50	12	2040	12	6,1	57
		4A			20	1300	35	17,3	164
		6A			25	900	56	36	340
		10A			46	160	19	161	1530
		16A			60	106	35	250	2270
10/24	442	2A	VVT-D	50	12	2040	12	6,1	57
		4A			20	1300	35	17,3	164
		6A			25	900	56	36	340
		10A			46	160	19	161	1530
		16A			60	106	35	250	2270
		20A			80	85	44	430	3750
		25A			105	67	58	650	5500
		32A			130	48	71	1220	10100
		40A			178	37,5	95	2270	18100

Time-current characteristics for VV-thermo fuse links - 36 kV



Dimensions



High voltage fuse-links for protection of voltage transformers

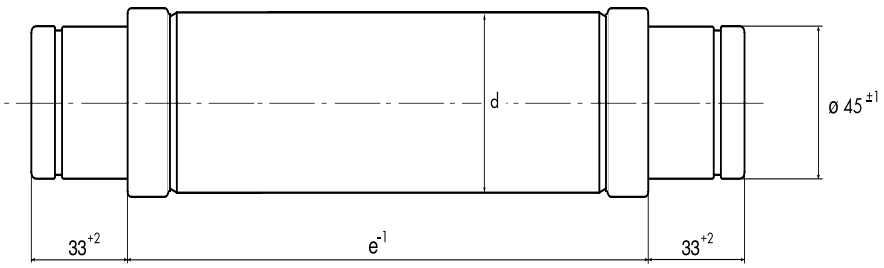
Ordering Code Numbers

rated voltage U_n [kV]	Dimension "e" according to DIN and IEC (mm)	rated current [A]	VVT-D	Tube diameter "d" (mm)	kg
10/24	235	2A	004251033	54	1,45
		4A	004251034		

Technical data

Rated voltage	Dimension "e" according to DIN and IEC	Rated current	Striker type	Rated breaking capacity	Rated minimum breaking current	Cold resistance	Power dissipation	Pre-arcing I^2t value	Total I^2t value
[kV]	[mm]	I_n [A]		[kA]	[A]	[mΩ]	[W]	[A^2s]	[A^2s]
10/24	235	2A	/	20	12	2040	14	6,1	57
		4A			20	1300	38	17,3	164

Dimensions



VV High Voltage Fuse Bases

Fuse bases for VV fuse-links

1-pole Indoor mounting

type	Rated voltage [kV]	code No.	Dimension "e" according to DIN and IEC [mm]	kg
VVP 7,2 1p-N	7,2	004229010	192	1
VVP 12 1p-N	12	004239010	292	1
VVP 17,5 1p-N	17,5	004249010	367	1
VVP 24 1p-N	24	004259010	442	1
VVP 36 1p-N	36	004269010	537	1

* when choosing right fuse base consider size and rated voltage of fuse-link
** due to safety reasons fuse bases cannot be later adjusted on different length by a user
*** indoor edition of fuse base may not be used for outside applications
**** Max thermal current: 100A, used with ETI VVT TD3 fuse-links.

1-pole Indoor mounting with microswitch fuse monitoring

type	Rated voltage <<< [kV]	code No.	Dimension "e" according to DIN and IEC [mm]	kg
VVP 7,2 1p-N + NK 7,2 BSW	7,2	004349019	192	1
VVP 12 1p-N + NK 12 BSW	12	004349020	292	1
VVP 17,5 1p-N + NK 17,5 BSW	17,5	004349021	367	1
VVP 24 1p-N + NK 24 BSW	24	004349022	442	1
VVP 36 1p-N + NK 7,2 BSW	36	004349023	537	1

* when choosing right fuse base consider size and rated voltage of fuse-link
** due to safety reasons fuse bases cannot be later adjusted on different length by a user
*** Rotation in installation is allowed only with the pin striker pointing upward (as in the photo on the right)
**** Max thermal current: 100A, used with ETI VVT TD3 fuse-links.

1-pole Outdoor mounting

type	Rated voltage [kV]	code No.	Dimension "e" according to DIN and IEC [mm]	kg
VVP 7,2 1p-Z	7,2	004229030	192	1
VVP 12 1p-Z	12	004239030	292	1
VVP 17,5 1p-Z	17,5	004249030	367	1
VVP 24 1p-Z	24	004259030	442	1
VVP 36 1p-Z	36	004269030	537	1

* when choosing right fuse base consider size and rated voltage of fuse-link
** due to safety reasons fuse bases cannot be later adjusted on different length by a user
**** Max thermal current: 100A, used with ETI VVT TD3 fuse-links.

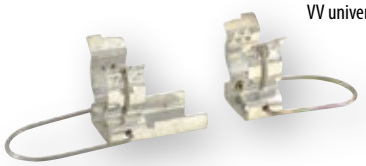
Accessories

Accessories for VVP fuse bases

type	Rated voltage [kV]	code No.	kg
Microswitch NK 7,2 BSW, INDOOR	7,2	004349007	1
Microswitch NK 12 BSW, INDOOR	12	004349008	1
Microswitch NK 17,5 BSW, INDOOR	17,5	004349009	1
Microswitch NK 24 BSW, INDOOR	24	004349010	1
Microswitch NK 36 BSW, INDOOR	36	004349011	1
VV universal clip with tail, prepared for M10 screw connection	7,2 - 36	004349015	1
VV universal clip	7,2 - 36	004349016	1

Microswitch

VV universal clip

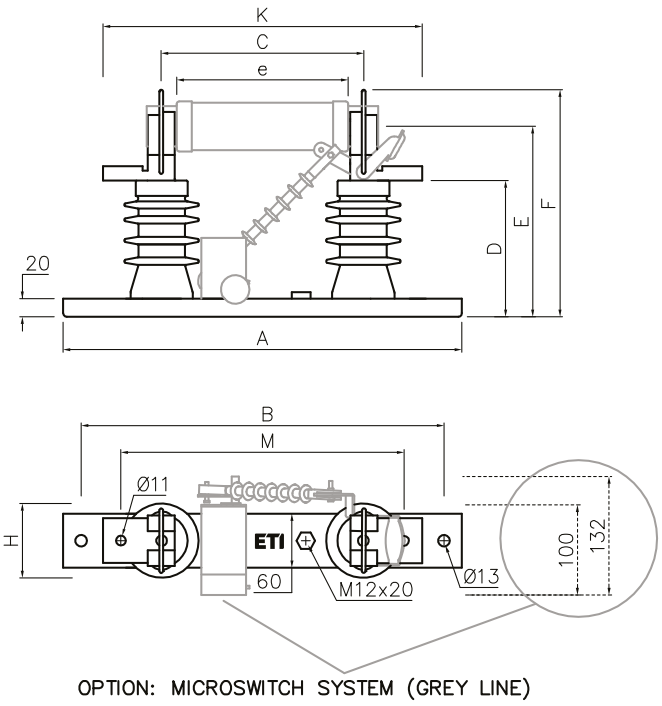


VV universal clip with tail

1-pole fuse-base	microswitch	U_n [kV]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	M [mm]	H [mm]	K [mm]	"e" Fuse length	Version
INDOOR MOUNTING	×	7,2	445	405	225	150	203	259	324	83	356	192	1
	✓	7,2	445	405	225	152	202	253	316	83	356	192	1
	×	12	405	205	325	150	203	259	424	83	456	292	2
	✓	12	405	205	325	152	202	253	416	83	456	292	2
	×	17,5	480	280	397	245	298	354	496	80	528	367	2
	✓	17,5	480	235	397	191	242	293	488	83	528	367	2
	×	24	555	355	475	245	298	354	574	80	606	442	2
	✓	24	555	355	475	245	295	346	566	77	606	442	2
	×	36	670	350	570	330	383	439	670	80	701	537	2
	✓	36	670	350	570	339	389	440	661	80	701	537	2
OUTDOOR MOUNTING	×	7,2	445	405	225	306	359	415	324	127	356	192	1
	×	12	405	205	235	306	359	415	424	127	456	292	2
	×	17,5	480	280	397	306	359	415	496	127	528	367	2
	×	24	555	355	475	306	359	415	574	127	606	442	2
	×	36	670	350	570	509	562	618	670	120	701	537	2

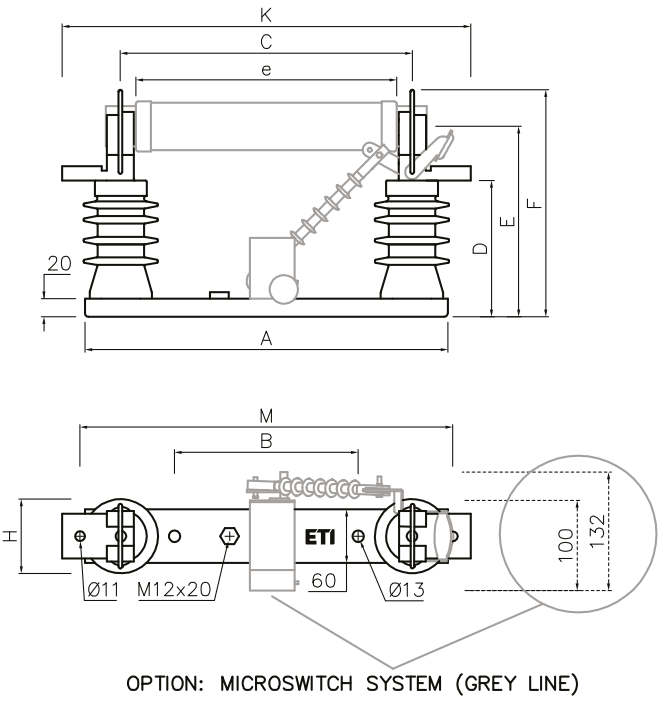
Dimensions

Version 1



OPTION: MICROSWITCH SYSTEM (GREY LINE)

Version 2



OPTION: MICROSWITCH SYSTEM (GREY LINE)

Definitions and terms

Back-up fuse-links
According to standard IEC 60282-1 Fifth edition (2002-01), item 3.3.3, Back-up fuse is current-limiting fuse capable of breaking, under specified conditions of use and behaviour, all currents from the rated maximum breaking current (I1) down to the rated minimum breaking current (I3).
Back-up fuse links should not operate below theirs minimum breaking current. If the short-circuit current of the transformer is lower than the minimum breaking current, additional protection must be provided.

Rated voltage range voltages
ETI VV Thermo fuse-links must be operated at the rated voltage. At lower operating voltages without limitation provided, please contact ETI team.

Breaking capacity I1
This value (sometimes named “rated maximum breaking current” of current indicates, that this is the maximum current which can be interrupted by the fuse-link. I1 should be greater than the maximum expected short circuit current at the fuse-link site.

Minimum breaking current I3
This value (sometimes named “rated minimum breaking current” is specified for Back-up fuse-links. Up from this current, fuse-link is capable to breaking fault current.

Power dissipation of a fuse-link Pn
The power dissipation of a VV Thermo fuse-link is specified at the rated current of the fuse-link. For calculations of protection with VV Thermo fuse-link, it should be noted, that operating current is normally below half of the rated current.

Time-current characteristics
I/t characteristics represents the correlation between current and time up to the melting of a silver fuse element. For coordination with other protection devices, melting integral must be referred for melting times below 100ms.

Current limitation
This is most significant advantage of fuse-links compared to mechanical switches. Contacts of that switches need much longer time as fuse-link to interrupt fault currents. VV fuse-link interrupt fault current within few milliseconds and sinusoidal current does not reach its peak value.

Switching voltages
Between current-limiting process, short circuit current must be limited and reduced as soon as possible. This require a switching voltage that exceed the normal system voltage and force the current to zero. Permissible value of switching voltage is 2.2 times peak value of the maximum rated voltage.

Selection of fuses for transformer protection

For HV fuse-link rated current selection, following transformer technical features has to be known:

- Rated power P_n (kVA)
- Short-circuit voltage U_{cc} (%)
- Rated current I_{nt}
- Inrush current usually between 8-12xI_{nt}
- Short-circuit current I_{cc}
- Overload current usually 1.4 I_{nt}
- Maximum short-circuit duration. Standard 2 sec for transformers up to 630 kVA and 3 sec for higher rated powers

Following HV fuse-link technical features has to be known:

- Rated voltage U_n (kV)
- Rated current I_n (A)
- I/t Characteristics According to the curves
- Melting current (0.1sec) I_f (0.1sec)
- Melting current at 2s ec or 3sec melting time
- Minimum breaking current I_3 (A)
- Breaking capacity I_1 (kA)

General about transformer protection:

- Fuse-link rated voltage U_n must be higher then network voltage.
- Maximum fuse-link breaking current I_1 must be higher then short circuit-current I_{cc}.
- Inrush current should not melt the fuse-link. Melting current at 100 msec must be higher than 12 times transformer rated current
- Fuse-link has to operate before the expected short-circuit current damage the transformer $I_{cc} > I_f$ (2 sec) or $I_{cc} > I_f$ (3 sec)
- Fuse-link must be able to withstand possible short duration overloads. I_n FUSE > 1.4 I_n TRAFO

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 I_{HV}	LV Fuse-Link NH gTr	LV Fuse-Link NH gG	Transformer rated primary current Ip(A) at	HV Fuse-link rated current I_{HV}	LV Fuse-Link gTr	LV Fuse-Link gG	Transformer rated primary current Ip(A) at	HV Fuse-link rated current I_{HVmin}	LV Fuse-Link gTr	LV Fuse-Link gG	Transformer rated primary current Ip(A) at	HV Fuse-link rated current I_{HVmin}	LV Fuse-Link gTr	LV Fuse-Link gG	Transformer rated primary current Ip(A) at	HV Fuse-link rated current I_{HVmin}	LV Fuse-Link gTr	LV Fuse-Link gG
Pt (kVA)	6kV	(A)	(kVA)	(A)	10kV	(A)	(kVA)	(A)	15kV	(A)	(kVA)	(A)	20kV	(A)	(kVA)	(A)	30kV	(A)	(kVA)	(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	75	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	**	**