

BATTERY FUSE



ETI BATTERY FUSE
 Obreza 5
 SI-1411 izlake
 NH3L 
630A gBat
 1500V d.c. 100kA
 L/R=3ms IEC 60269-7
 004110779
 RoHS ENEC CE 
 Made in Slovenia W3/2022

$\frac{L}{+}$
 BATTERY
 FUSE

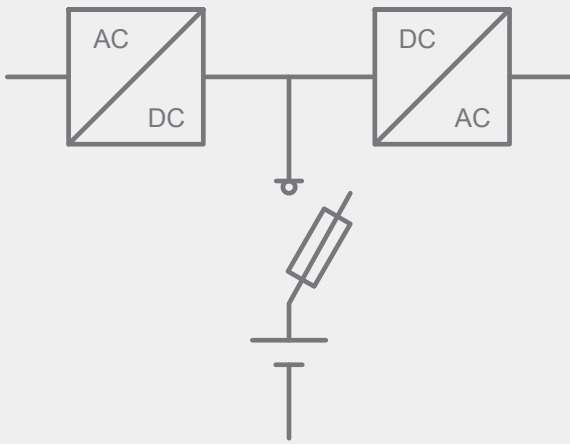
BECAUSE EVERY SECOND COUNTS

Application

- in battery storage systems
- in UPS systems
- in e-mobility

Battery Protection Fuses

Battery storage fuse selection

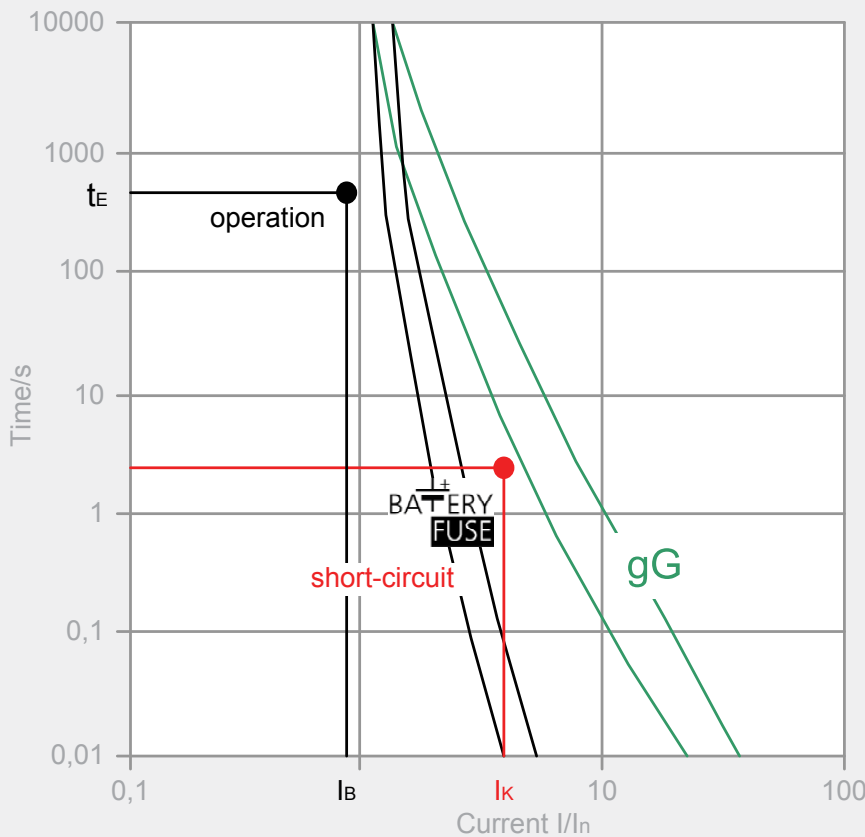


Short circuit current

- Short circuit current depending on battery model, type and capacity, low compared to operating current
- Short circuit current has to be interrupted in <5 seconds
- Required steep characteristics: protection with Battery fuse link required!

Operating current

- Operating current depends on battery storage specification
- Battery operation: voltage of DC link circuit decreases to the final discharge voltage
- Consider maximum current at final discharge voltage for fuse link selection



Short circuit point (I_K)

- Short circuit current depending on battery model and type
- Manufacturer datasheets to include short circuit current according to IEC896
- Operating point has to be in adequate distance below the curve
- Short-circuit point has to be above the range of tolerance of the curve

Operating point (t_E/I_B)

- maximum operating current I_B has to be calculated from battery storage true power and final discharge voltage $U_E: I_B = P_W/U_E$
- t_E is the back-up time of battery storage system

When choosing fuse switch disconnector consider fuse link power dissipation!

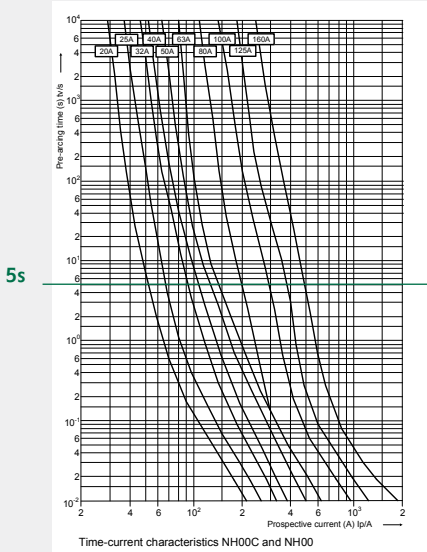
$$P_d(I_B) < P_y$$

Power dissipation of fuse link at maximal operating current (I_B):

$$P_d(I_B) = (I_B/I_n)^2 \times P_d(I_n)$$

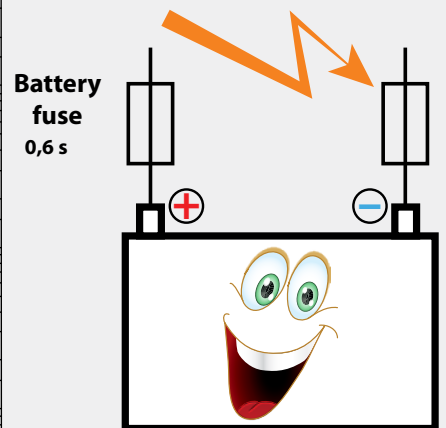
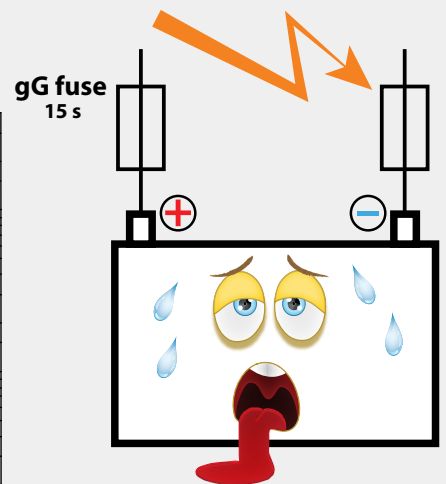
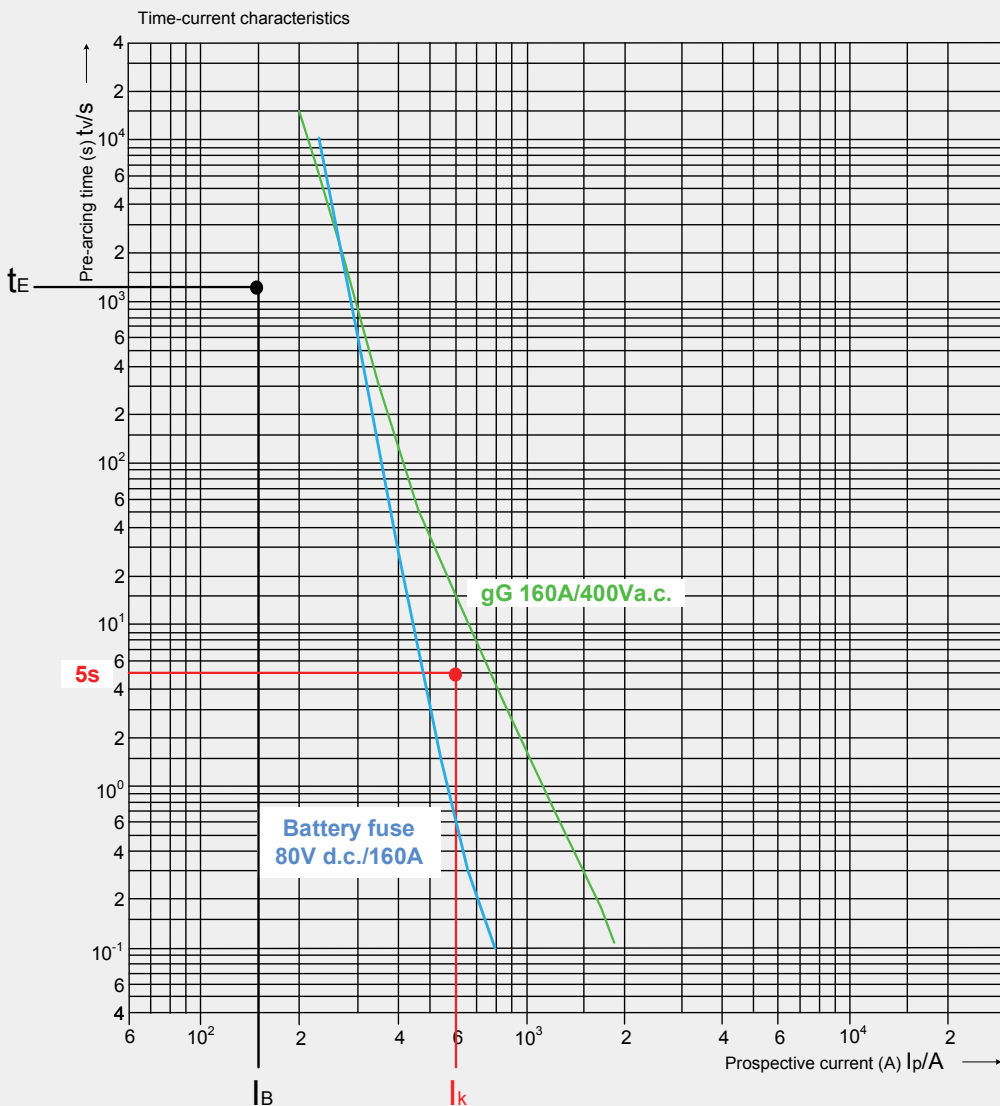
- I_B - maximal operating current
- $P_d(I_B)$ - power dissipation of fuse link at maximal operating current
- $P_d(I_n)$ - power dissipation of fuse link at nominal current
- P_y - maximal permissible fuse link power dissipation mounted in fuse switch disconnector

Low power dissipation and fast characteristic in time range of 5s!



Discharge	-20~60°C
Charge	-10~60°C
Storage	-20~60°C
Max. Discharge Current 77°F(25°C)	1000A(5s)
Short Circuit Current	3300A
Charge Methods: Constant Voltage Charge 77°F(25°C)	
Cycle use	14.4-14.7V
Maximum charging current	60A
Temperature compensation	-30mV/°C

Better protection of battery cells on overheating in case of short circuit comparable to standard gG characteristic



Green protect - gBat

NH BATTERY fuse link 80V d.c.

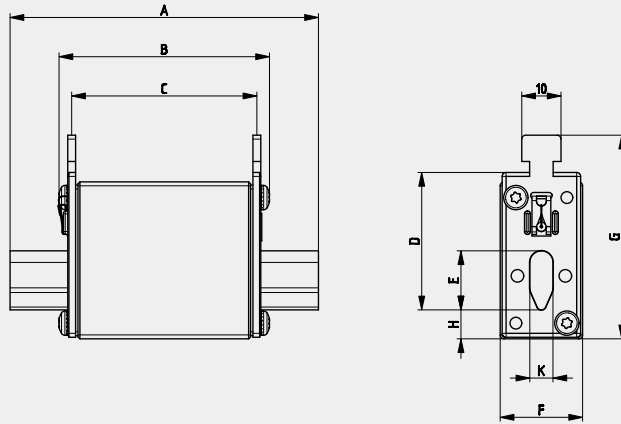
General characteristics	
Rated voltage	80V d.c., L/R=10ms
Breaking capacity	50kA d.c..
Standard	IEC 60269-7
Application	Battery protection
Fuse base	NH003, NH00: 004123001 PK00 NH1C, NH1: 004123100 PK1

NH BATTERY fuse link 80V d.c.								
Size	I_n	Standard indicator	Power dissipation	Power dissipation $0,7 \times I_n$	Pre-arcing Joule integral	Operating Joule integral	Weight	Pack.
	[A]		[W]	[W]	[A ² s]	[A ² s]	[g]	[pcs]
00C pic. 1	20	004110075	4,6	2	360	414	125	3/120
	25	004110076	5,8	2,6	710	817		
	32	004110077	6,6	3	920	1.058		
	40	004110078	9,4	4,2	1.440	1.656		
	50	004110079	11,1	5	2.820	3.243		
00 pic. 1	63	004110080	11,7	5,2	4.160	4.784	173	3/90
	80	004110081	10,4	4,7	4.670	5.371		
	100	004110082	11,1	5	9.360	10.764		
	125	004110083	13,4	6	14.750	16.963		
	160	004110084	15,5	7	27.880	32.062		
1C pic. 2	20	004110085	6,3	2,8	360	414	233	3/45
	25	004110086	7,3	3,3	710	817		
	32	004110087	9	4	920	1.058		
	40	004110088	11,2	5	1.440	1.656		
	50	004110089	14,5	6,5	2.820	3.243		
	63	004110090	16,8	7,5	4.160	4.784		
	80	004110091	11,4	5,1	4.670	5.371		
	100	004110092	12	5,4	9.360	10.764		
	125	004110093	14,8	6,6	14.750	16.963		
1 pic. 3	160	004110094	17,6	7,9	27.880	32.062	430	3/24
	200	004110095	26,6	11,9	41.990	48.289		
	250	004110096	31	13,9	81.000	93.150		

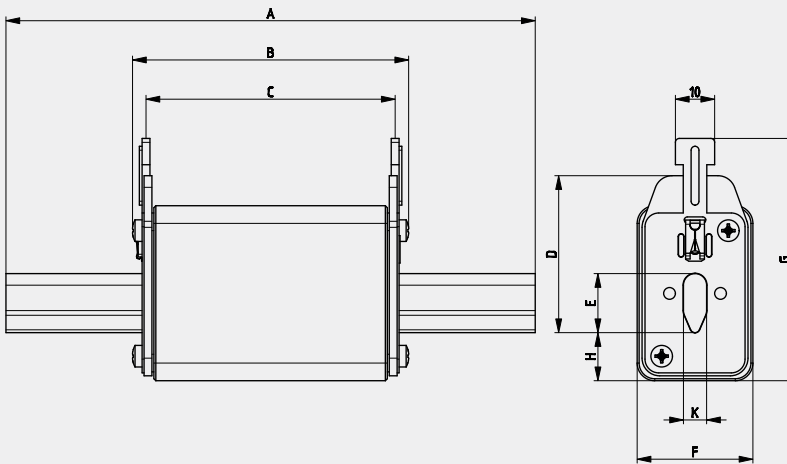


Dimensions

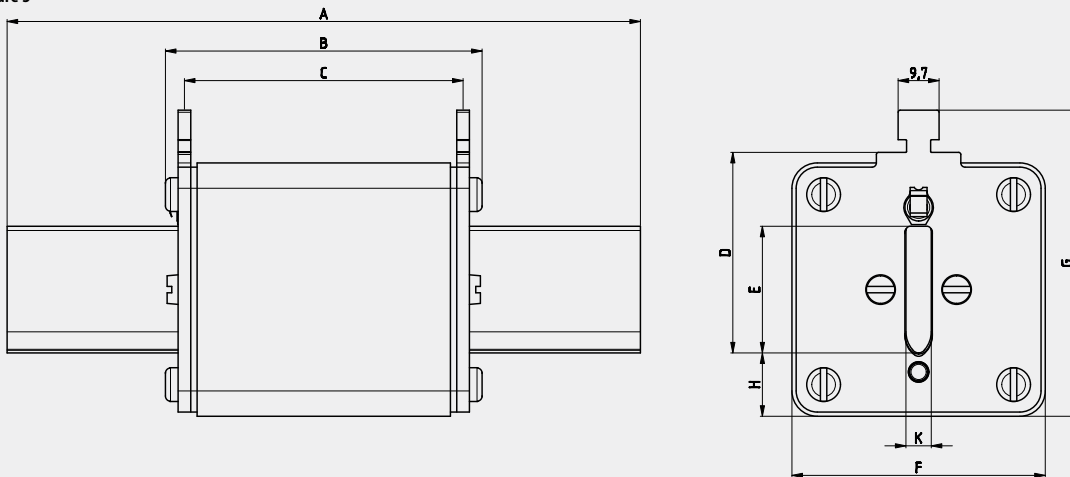
Picture 1



Picture 2



Picture 3

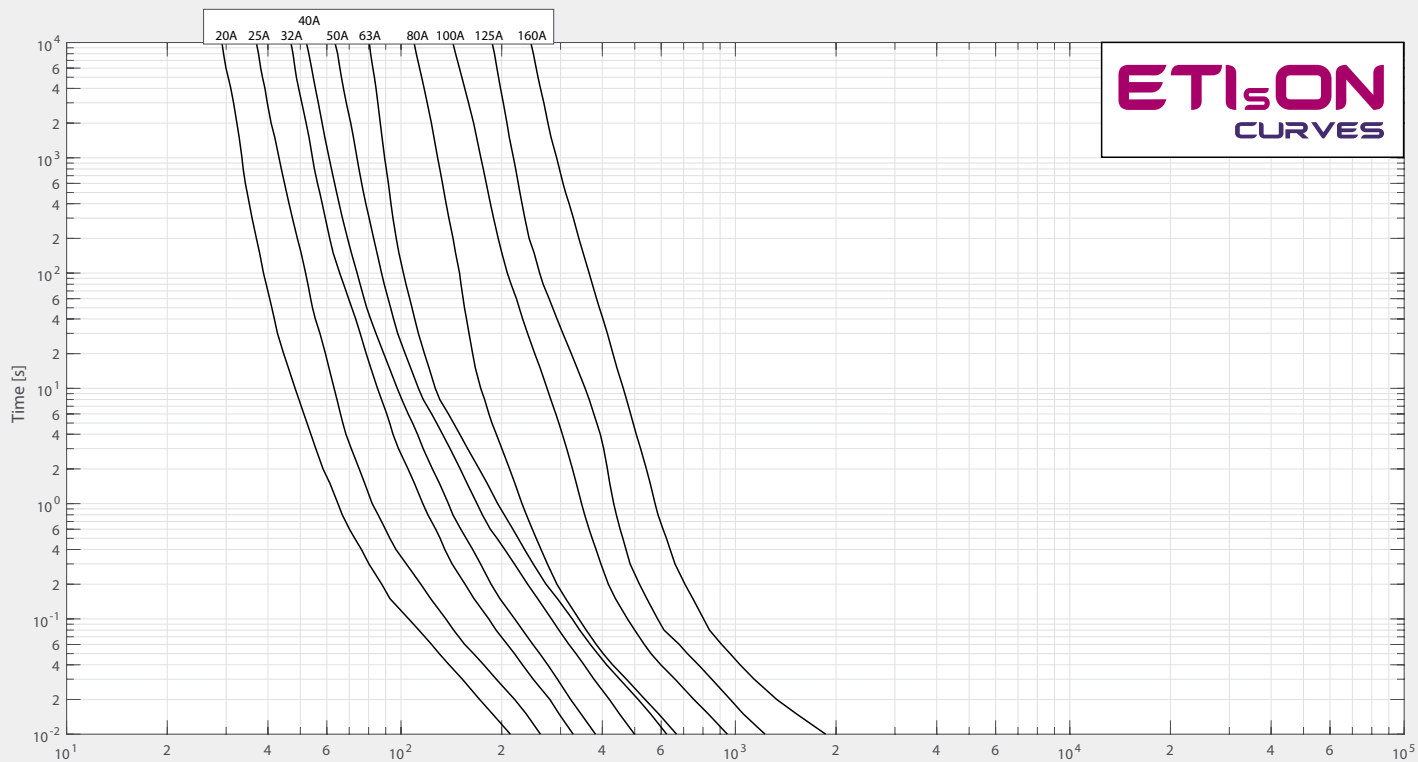


	A	B	C	D	E	F	G	H	K
00 C	79	53	47	35	15	21	52	7,5	6
00	79	53	47	35	15	28	56	12	6
1 C	135	68	65	40	15	28	61	12	6
1	135	72	65	40	20	46	65	14	6

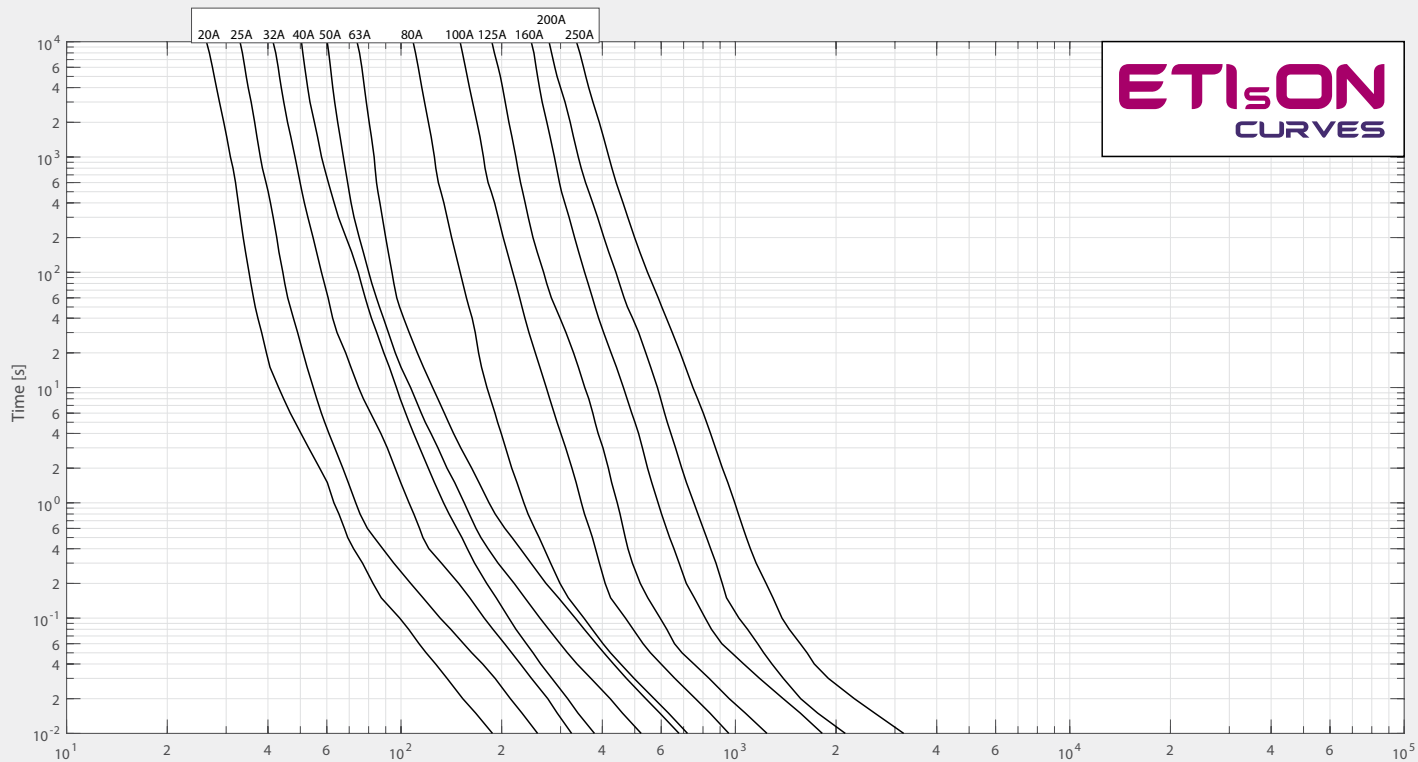


I/t characteristics for NH Battery fuses

NH00C & NH00



NH1C & NH1



Green protect - gBat



NH BATTERY fuse link 440V d.c.

General characteristics	
Rated voltage	440V d.c., L/R=10ms
Breaking capacity	30kA d.c.
Standard	IEC 60269
Application	Battery protection



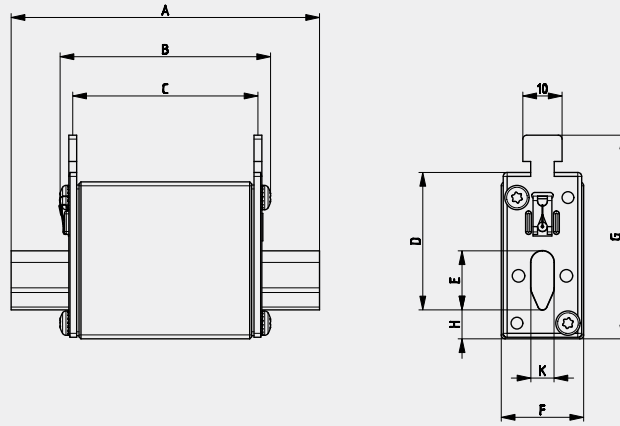
NH BATTERY fuse link 440 V d.c.									
Size	I_n	Standard indicator	Power dissipation	Power dissipation $0,7 \times I_n$	Pre-arcing Joule integral L/R=10ms	Operating Joule integral L/R=10ms	For use with	Weight	Pack.
	[A]		[W]	[W]	[A ² s]	[A ² s]		[g]	[pcs]
00 pic. 1	32	004110209	6,6	3	920	1.656	PK00 004123001	173	3/90
	40	004110219	9,4	4,2	1.440	2.592			
	50	004110218	11,1	5	2.820	5.076			
	63	004110217	11,7	5,2	4.160	7.488			
	80	004110216	10,4	4,7	4.670	8.406			
	100	004110215	11,1	5	9.360	16.848			
1C pic. 2	20	004723103	6,3	2,8	360	648	PK1 004123100	233	3/45
	25	004723104	7,3	3,3	710	1.278			
	32	004723105	9	4	920	1.656			
	40	004723106	11,2	5	1.440	2.592			
	50	004723107	14,5	6,5	2.820	5.076			
	63	004723108	16,8	7,5	4.160	7.488			
	80	004723109	11,4	5,1	4.670	8.406			
	100	004723110	12	5,4	9.360	16.848			
	125	004723111	14,8	6,6	14.750	26.550			
160	004723112	17,6	7,9	27.880	50.184				

Green protect - gBat

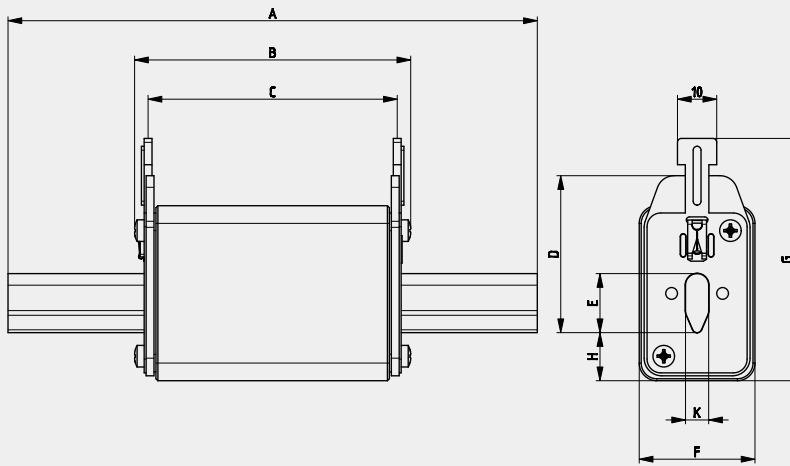


Dimensions

Picture 1



Picture 2



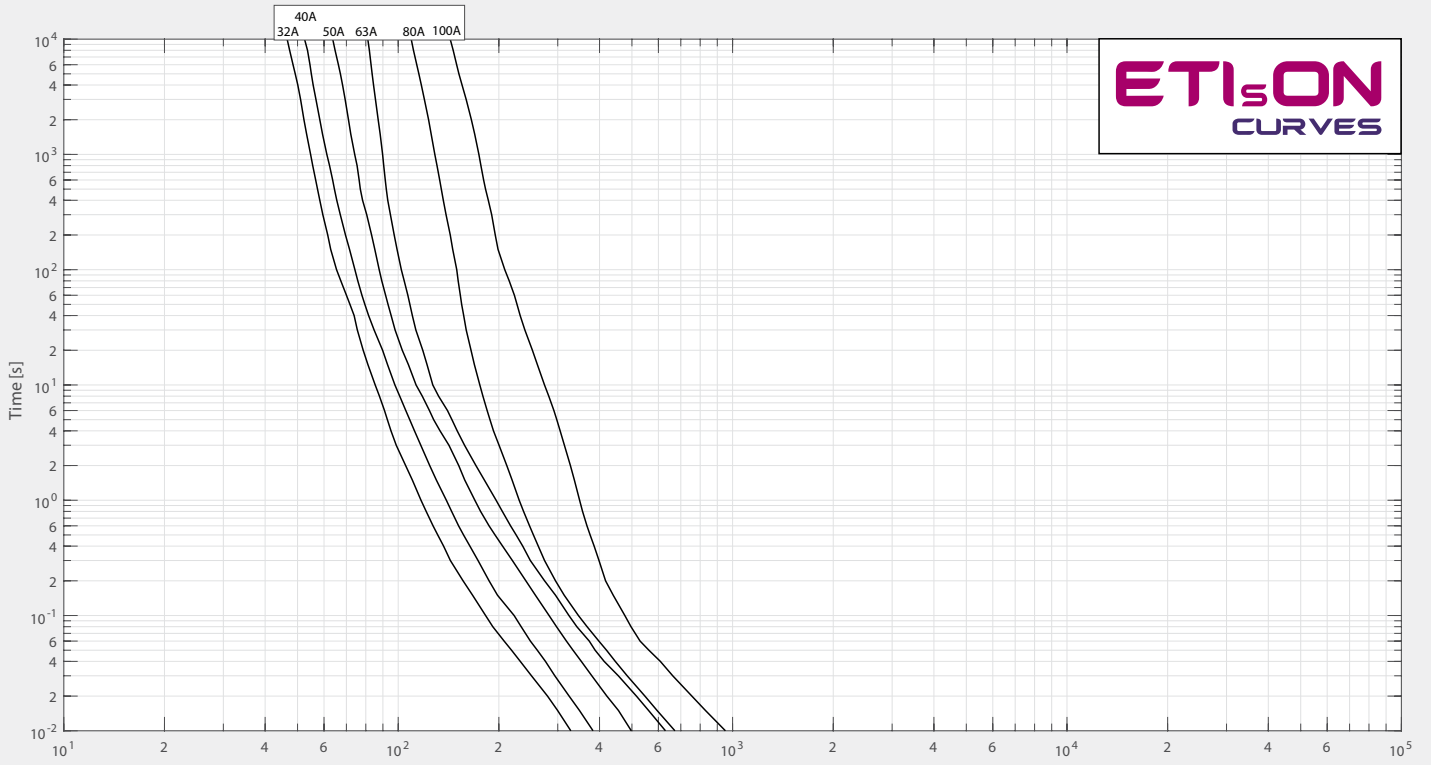
	A	B	C	D	E	F	G	H	K
00	79	53	47	35	15	28	56	12	6
1C	135	68	65	40	15	28	61	12	6

Green protect - gBat

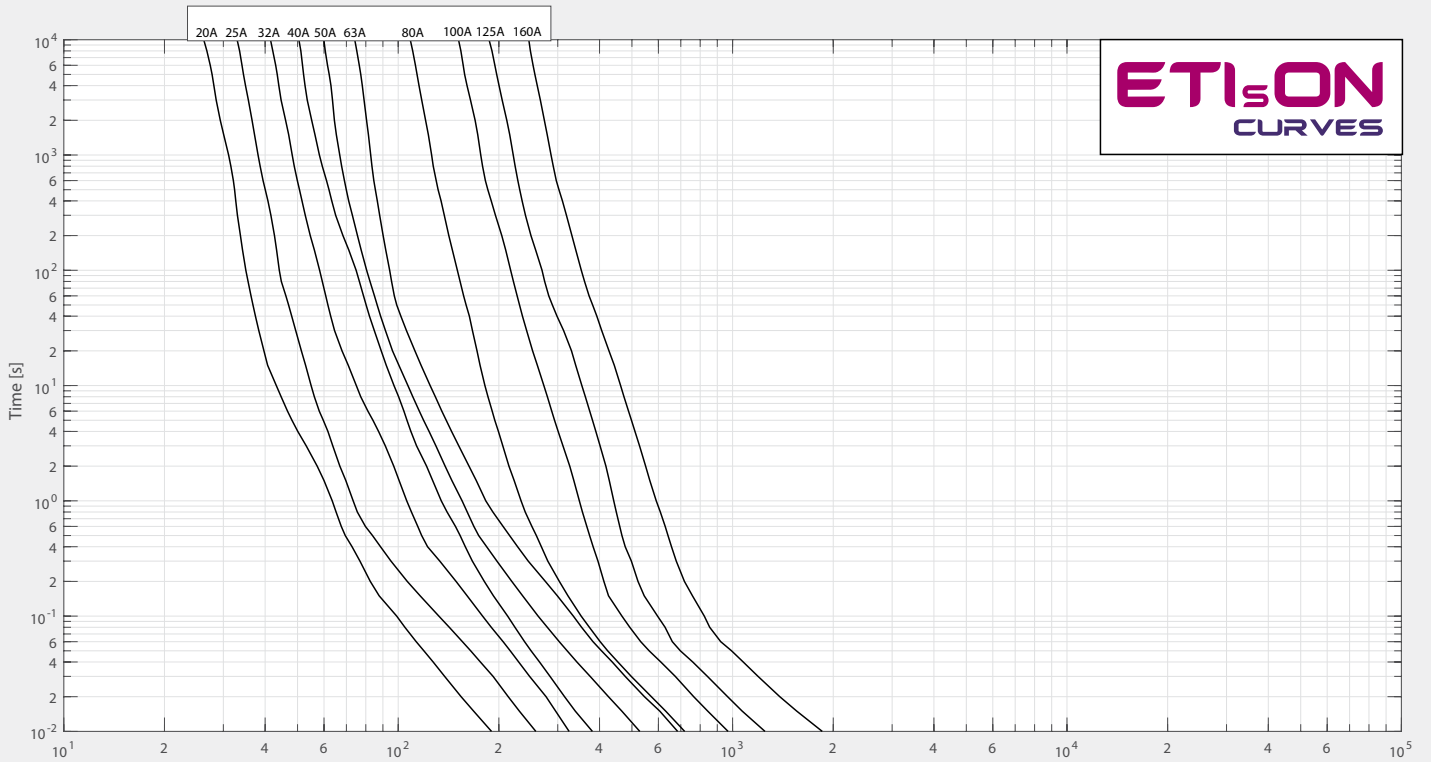


I/t characteristics for NH Battery fuses

NH00



NH1C

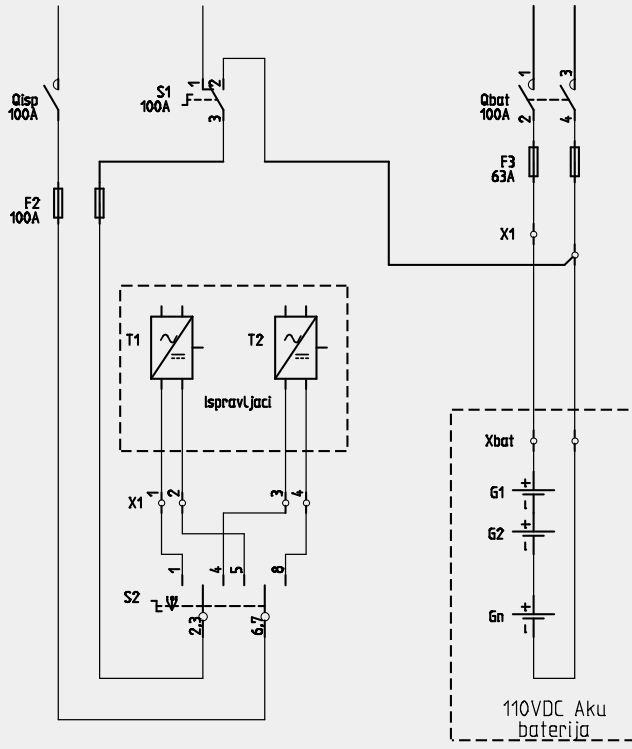


Green protect - gBat





Application



NH BATTERY fuse link 550V d.c.



General characteristics	
Rated voltage	550V d.c. (L/R=10ms)
Breaking capacity	30kA d.c.
Standard	IEC 60269
Application	Battery protection

NH BATTERY fuse link 550 V d.c.

Size	I_n	Standard indicator	Striker indicator	Standard indicator S110mm	Power dissipation	Power dissipation $0,7 \times I_n$	Pre-arcing Joule integral L/R=10ms	Operating Joule integral L/R=10ms	For use with	Weight	Pack.
	[A]	pic. 1	pic. 2	pic. 3	[W]	[W]	[A ² s]	[A ² s]		[g]	[pcs]
1	40	004723259	004723279	004723269	6	2,7	250	833	PK1DC 004122025	420	3/24
	50	004723260	004723280	004723270	7	3,1	449	1.495			
	63	004723261	004723281	004723271	9	4	700	2.331			
	80	004723262	004723282	004723272	12	5,4	1.200	3.996			
	100	004723263	004723283	004723273	15	6,7	1.650	5.495			
	125	004723264	004723284	004723274	20	9	2.200	7.326			
	160	004723265	004723285	004723275	26	11,7	4.300	14.319			
	200	004723266	004723286	004723276	32	14,4	8.500	28.305			
	224	004723267	004723287	004723277	37	16,6	10.000	33.300			
	250	004723268	004723288	004723278	43	19,3	15.000	50.000			
2	125	004724260	004724280	004724270	20	9	2.200	10.296	PK2DC 004122024	660	3/24
	160	004724261	004724281	004724271	26	11,7	4.300	20.124			
	200	004724262	004724282	004724272	32	14,4	8.500	39.780			
	224	004724263	004724283	004724273	37	16,6	10.000	46.800			
	250	004724264	004724284	004724274	43	19,3	15.000	70.200			
	315	004724265	004724285	004724275	57	26,6	20.000	93.600			
	350	004724266	004724286	004724276	67	30	28.000	131.040			
3	250	004725260	004725280	004725270	43	19,3	15.000	65.550	PK3DC 004122023	870	3/24
	315	004725261	004725281	004725271	57	26,6	20.000	87.400			
	350	004725262	004725282	004725272	67	30	28.000	122.360			
	400	004725263	004725283	004725273	76	34,2	32.000	139.840			
	425	004725264	004725284	004725274	84	37,8	40.000	174.800			
	500	004725265	004725285	004725275	110	49,5	44.000	192.280			
630	004725266	004725286	004725276	160	72	80.000	350.000				

Green protect - gBat

NH BATTERY fuse link 700V d.c.



General characteristics	
Rated voltage	700V d.c. (L/R=10ms)
Breaking capacity	30kA d.c.
Standard	IEC 60269
Application	Battery protection



NH BATTERY fuse link 700 V d.c.											
Size	I_n	Standard indicator	Striker indicator	Standard indicator S110mm	Power dissipation	Power dissipation $0,7 \times I_n$	Pre-arcing Joule integral L/R=10ms	Operating Joule integral L/R=10ms	For use with	Weight	Pack.
	[A]	pic. 1	pic. 2	pic. 3	[W]	[W]	[A ² s]	[A ² s]		[g]	[pcs]
1	40	004723289	004723309	004723299	6	2,7	250	1.000	PK1DC 004122025	420	3/24
	50	004723290	004723310	004723300	7	3,1	449	1.796			
	63	004723291	004723311	004723301	9	4	700	2.800			
	80	004723292	004723312	004723302	12	5,4	1.200	4.800			
	100	004723293	004723313	004723303	15	6,7	1.650	6.600			
	125	004723294	004723314	004723304	20	9	2.200	8.800			
	160	004723295	004723315	004723305	26	11,7	4.300	17.200			
	200	004723296	004723316	004723306	32	14,4	8.500	34.000			
	224	004723297	004723317	004723307	37	16,6	10.000	40.000			
	250	004723298	004723318	004723308	43	19,3	15.000	60.000			
2	125	004724290	004724310	004724300	20	9	2.200	11.682	PK2DC 004122024	660	3/24
	160	004724291	004724311	004724301	26	11,7	4.300	22.833			
	200	004724292	004724312	004724302	32	14,4	8.500	45.135			
	224	004724293	004724313	004724303	37	16,6	10.000	53.100			
	250	004724294	004724314	004724304	43	19,3	15.000	79.650			
	315	004724295	004724315	004724305	57	26,6	20.000	106.200			
	350	004724296	004724316	004724306	67	30	28.000	148.680			
3	250	004725290	004725304	004725297	43	19,3	15.000	75.000	PK3DC 004122023	870	3/24
	315	004725291	004725305	004725298	57	26,6	20.000	100.000			
	350	004725292	004725306	004725299	67	30	28.000	140.000			
	400	004725293	004725307	004725300	76	34,2	32.000	160.000			
	425	004725294	004725308	004725301	84	37,8	40.000	200.000			
	500	004725295	004725309	004725302	110	49,5	44.000	220.000			
630	004725296	004725310	004725303	160	72	80.000	400.000				

Green protect - gBat

NH BATTERY fuse link 800V d.c.



General characteristics	
Rated voltage	800V d.c. (L/R=10ms)
Breaking capacity	30kA d.c.
Standard	IEC 60269
Application	Battery protection
Fuse base	NH1: 004122025 PK1DC NH2: 004122024 PK2DC NH3L: 004132023 PK3L 1500V

NH BATTERY fuse link 800 V d.c.										
Size	I_n	Standard indicator	Striker indicator	Standard indicator S110mm	Power dissipation	Power dissipation $0,7 \times I_n$	Pre-arcing Joule integral L/R=10ms	Operating Joule integral L/R=10ms	Weight	Pack.
	[A]	pic. 1	pic. 2	pic. 3	[W]	[W]	[A ² s]	[A ² s]	[g]	[pds]
1	40	004723320	004723330	004723340	6	2,7	250	1.750	420	3/24
	50	004723321	004723331	004723341	7	3,1	449	3.143		
	63	004723322	004723332	004723342	9	4	700	4.900		
	80	004723323	004723333	004723343	12	5,4	1.200	8.400		
	100	004723324	004723334	004723344	15	6,7	1.650	11.550		
	125	004723325	004723335	004723345	20	9	2.200	15.400		
	160	004723326	004723336	004723346	26	11,7	4.300	30.100		
2	125	004724320	004724330	004724340	20	9	2.200	13.046	660	3/24
	160	004724321	004724331	004724341	26	11,7	4.300	25.499		
	200	004724322	004724332	004724342	32	14,4	8.500	50.405		
	224	004724323	004724333	004724343	37	16,6	10.000	59.300		
	250	004724324	004724334	004724344	43	19,3	15.000	88.950		
	315	004724325	004724335	004724345	57	26,6	20.000	118.600		
	350	004724326	004724336	004724346	67	30	28.000	166.040		
3L*	400	004724327	004724337	004724347	76	34,2	32.000	190.000	1970	1/10
	500	004110350	-	-	112	50	150.000	300.000		

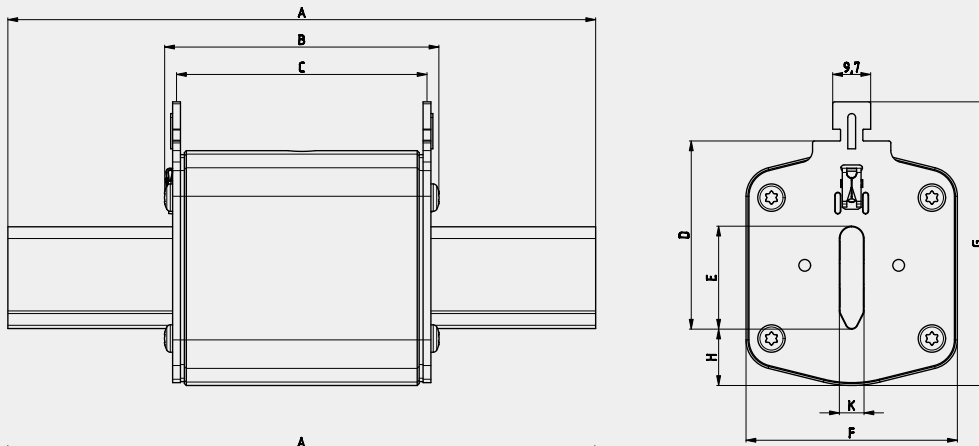
*Pic 4

Green protect - gBat

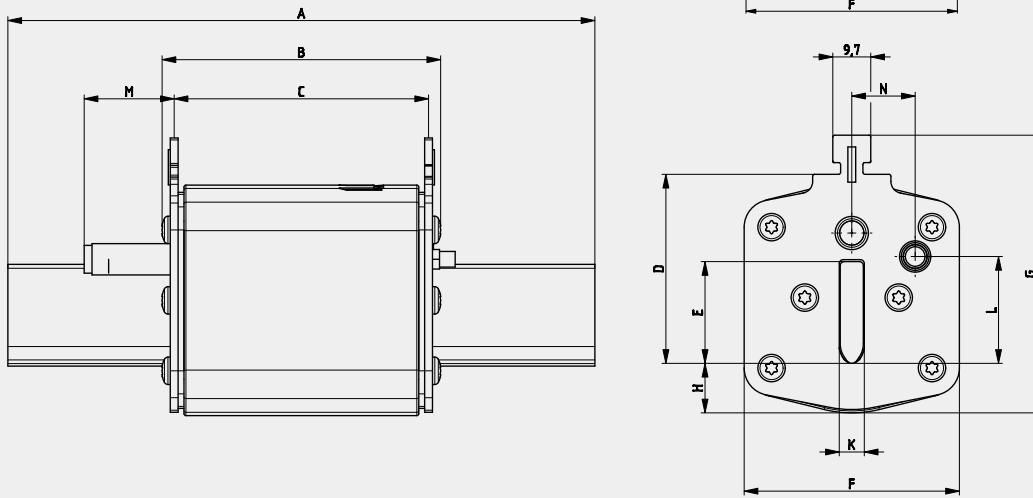


Dimensions

pic. 1

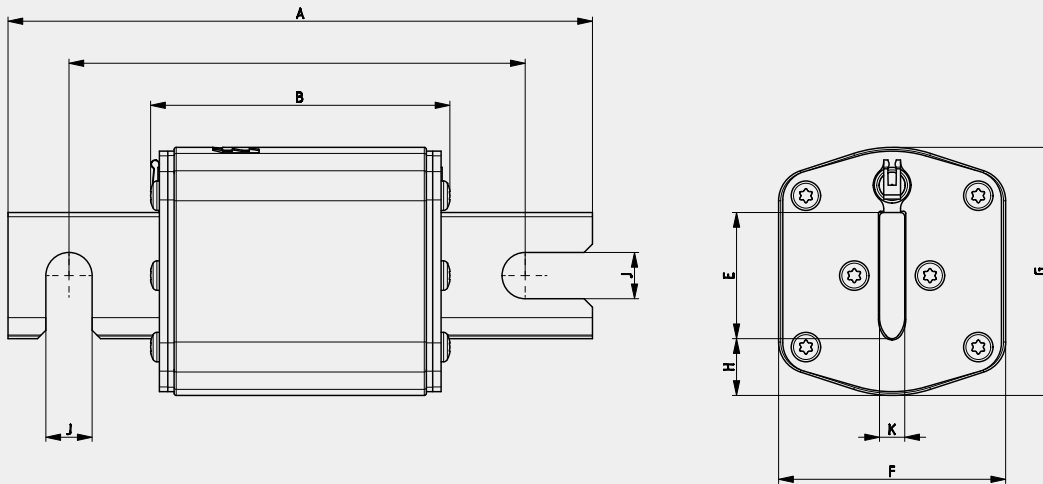


pic. 2



Size	A	B	C	D	E	F	G	H	K	L	M	M
1	135	73	65	40	24	46	62	12	6	20,5	27,5	13,7
2	150	73	65	48	30	54	71	13	6	27,3	27,5	16,2
3	150	73	65	60	37	64	84	14	6	35,6	27,5	17

pic. 3

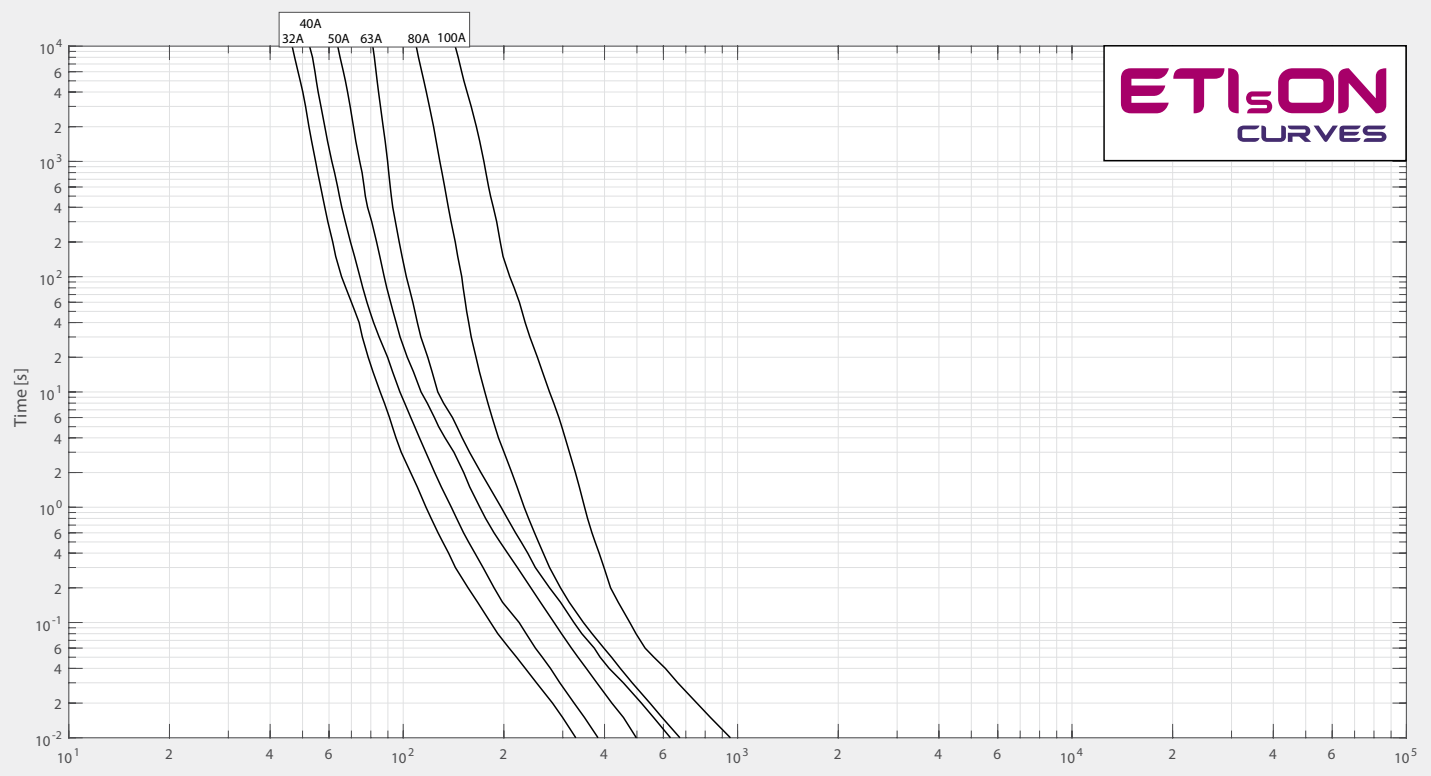


Size	A	B	E	F	G	H	J	K
1	140	72	24	46	51	12	11	6
2	140	72	30	54	59	13	11	6
3	140	72	37	64	70	14	11	6

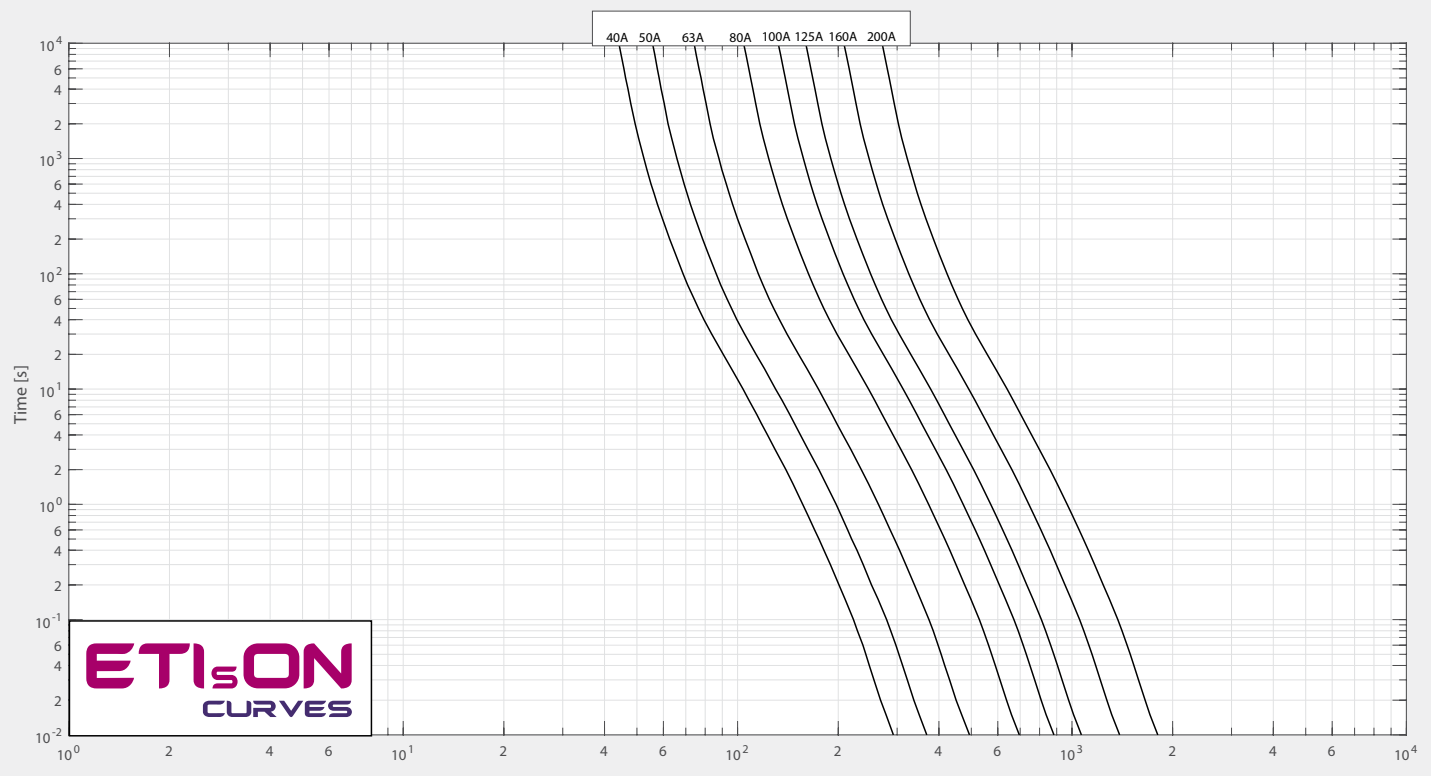


I/t characteristics for NH Battery fuses sizes 1, 2, 3

NH1 550V, 700V



NH1 800V

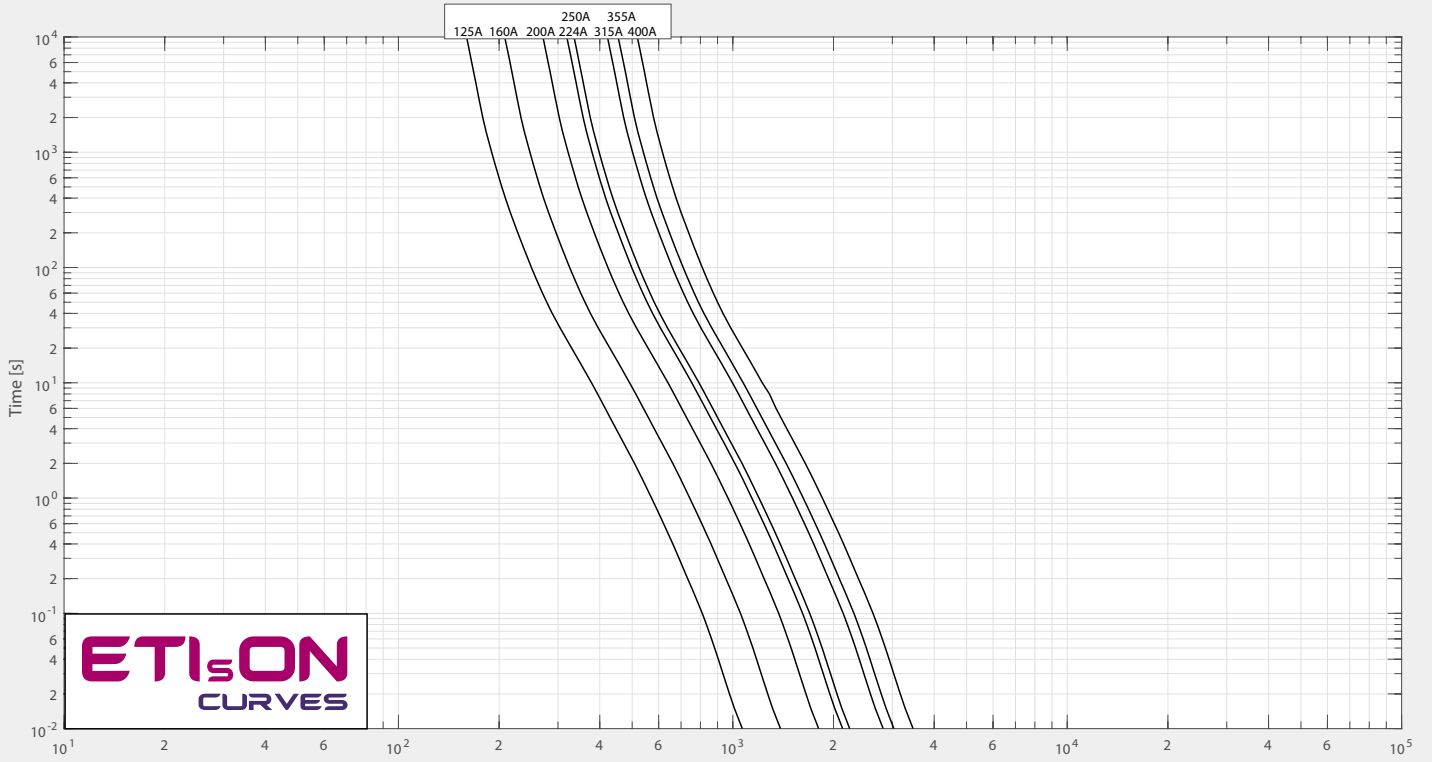


Green protect - gBat

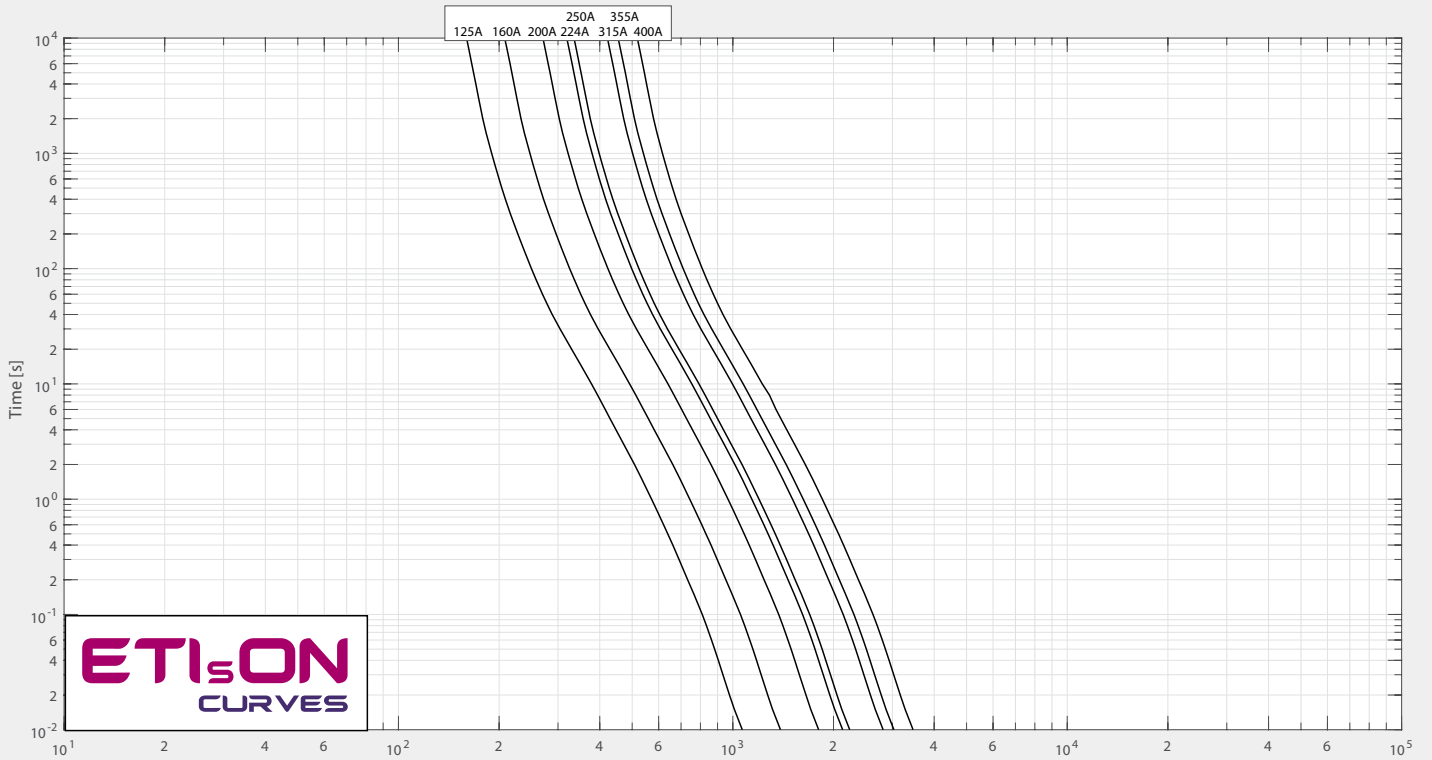




NH2 550V, 700V

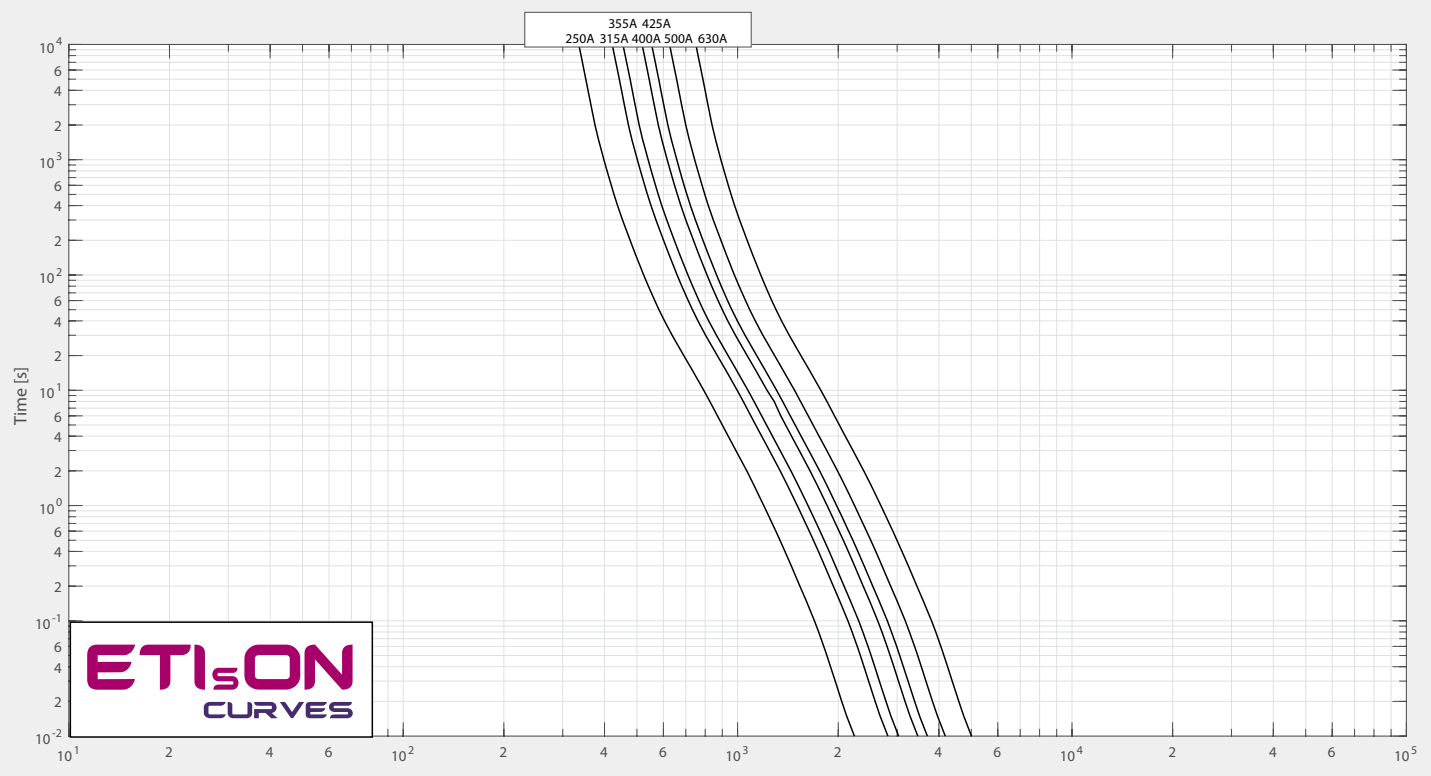


NH2 800V





NH3 550V, 700V



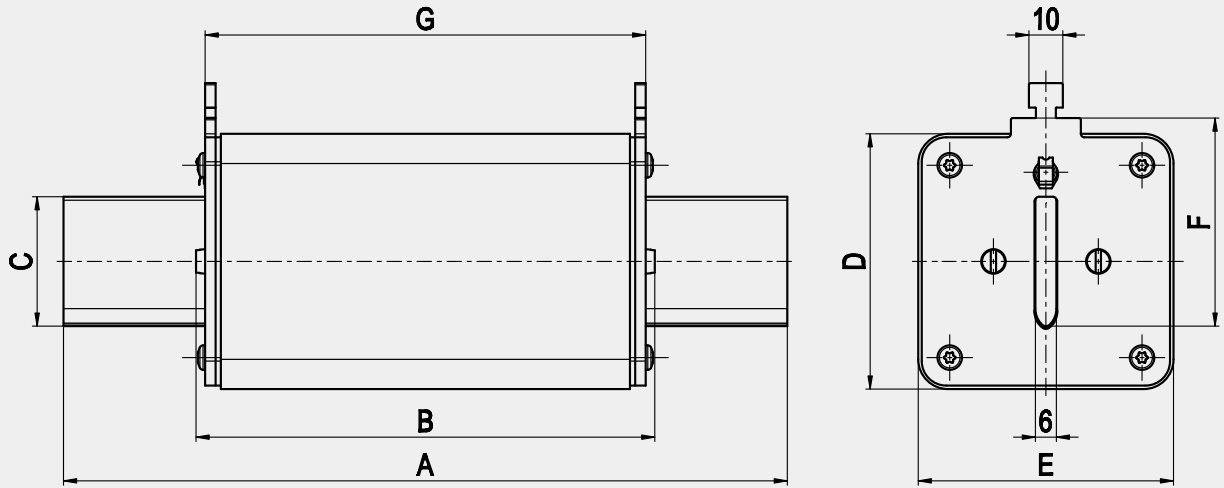
ETISON
CURVES

Green protect - gBat





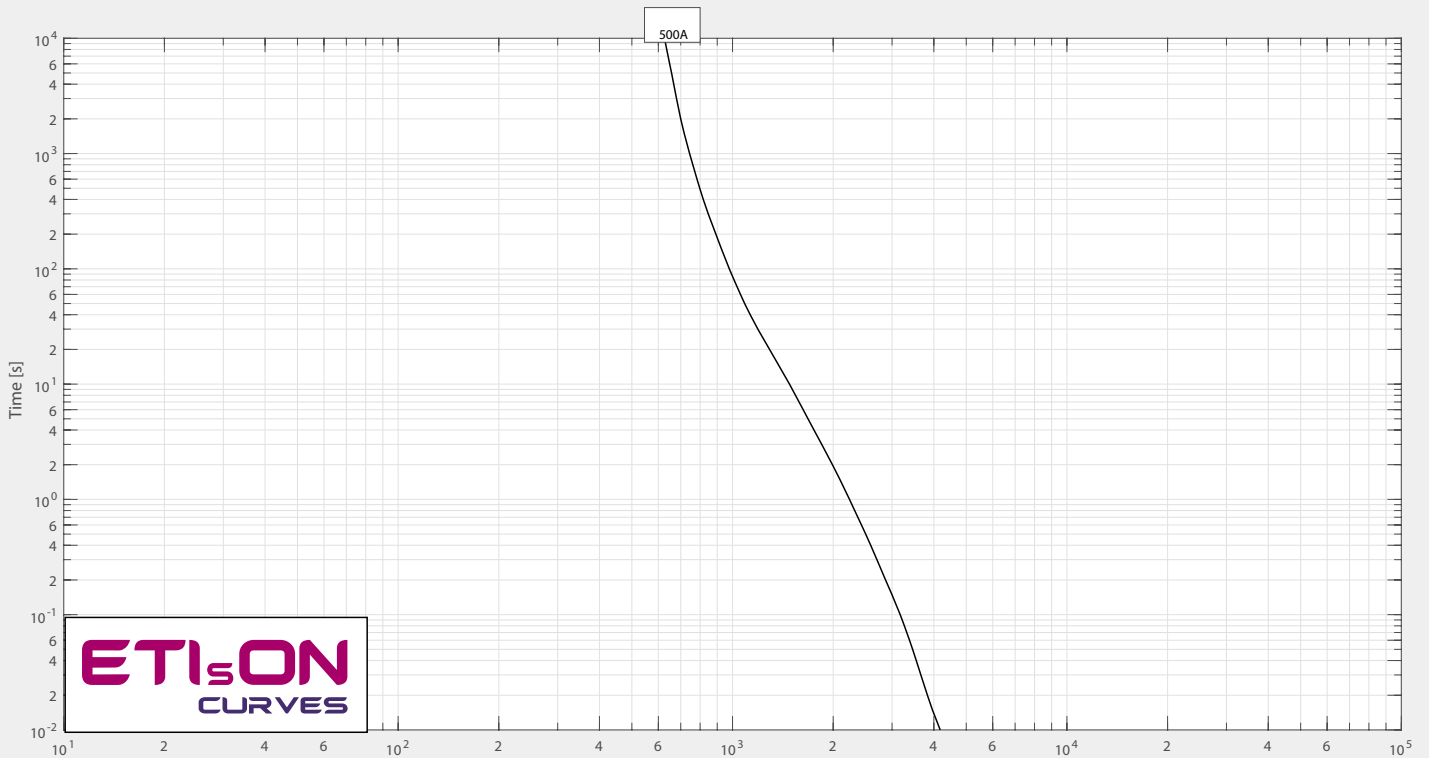
pic. 4



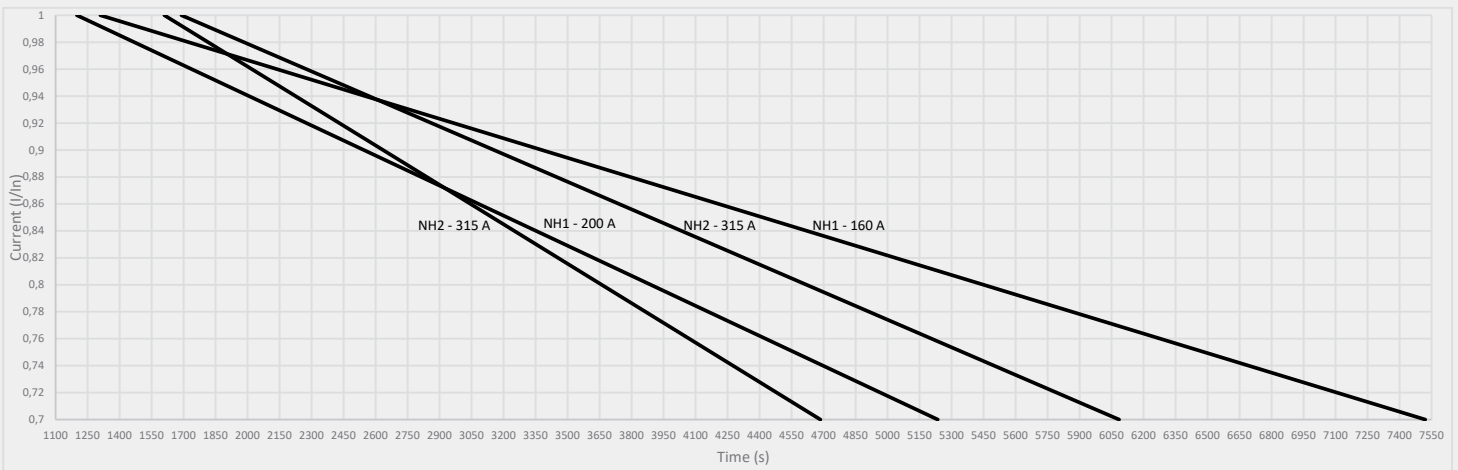
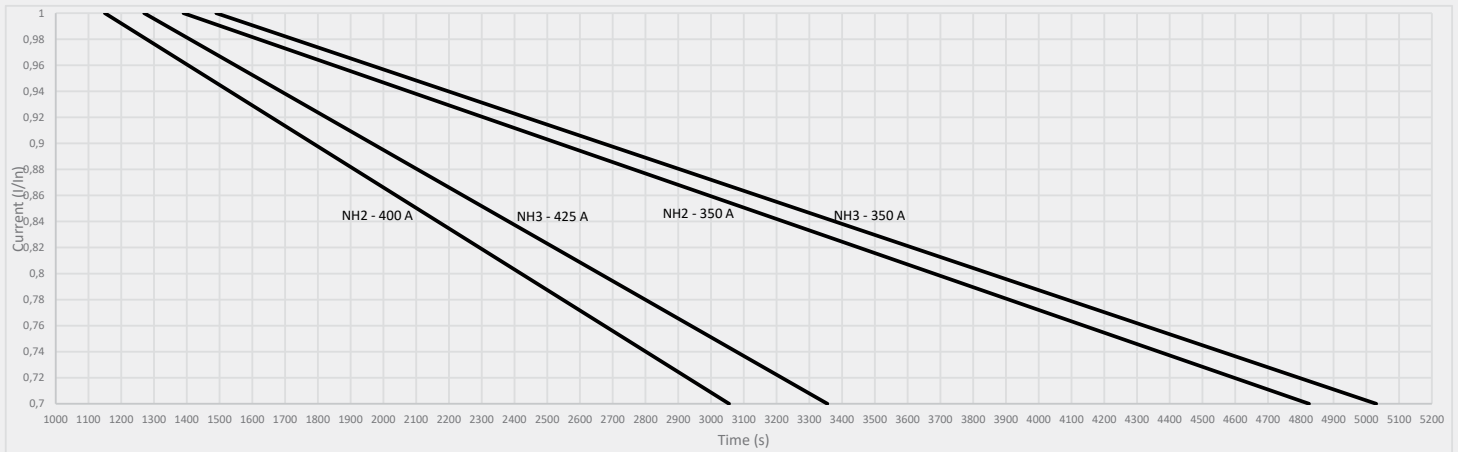
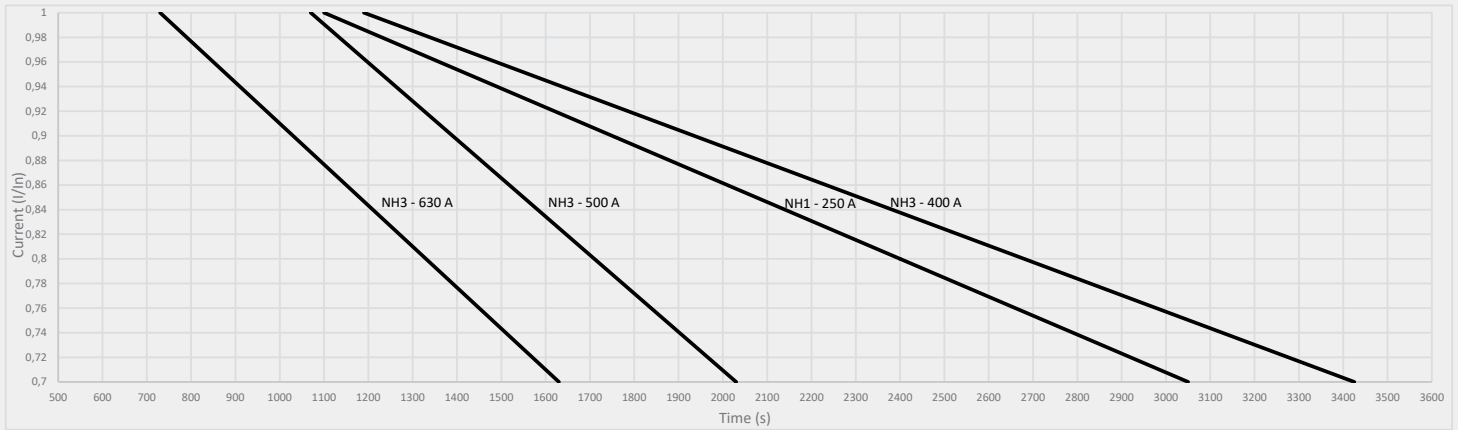
	A	B	C	D	E	F	G	H	J
3L	208	130	37	73	73	60	126	11	13

I/t characteristics for NH Battery fuses size 3L

NH3L 800V



Battery fuse NH1,2,3 550V, 700V, 800V d.c.-current loading derating factor in disconnect



NH Battery fuse link 1000V d.c.

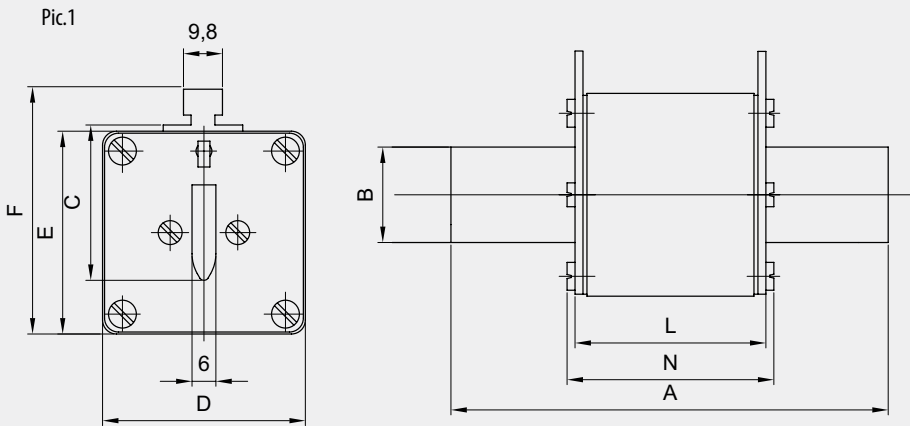
General characteristics

Rated voltage	1000V d.c. (L/R=1ms)
Breaking capacity	30kA d.c.
Standard	IEC 60269
Application	Fuse link for battery protection.



NH BATTERY fuse link 1000V d.c.

Size	I_n	Standard indicator	S_{110} screw contact	U_{110} screw contact	G screw contact with centre trip indicator for microswitch MK	Power dissipation	Power dissipation $0,7xI_n$	Pre-arcing Joule integral	Operating Joule integral	Weight	Pack.
	[A]	pic. 1	pic. 2	pic. 3	pic. 4	[W]	[W]	[A ² s]	[A ² s]	[g]	[pcs]
1	200	004110760	/	/	/	27	11	4.400	29.000	500	3/24
2	200	004110761	004110769	004110774	004110755	26	11	4.400	29.000	650	1/16 (G type 2/32)
	250	004110762	004110770	004110775	004110756	36	15	6.000	38.000		
3	160	004110763	/	/	/	38	15	5.000	10.000	1200	3/15 (G type 2/9)
	200	004110764	/	/	/	45	18	10.000	20.000		
	250	004110765	/	/	/	44	18	20.000	40.000		
	315	004110766	004110771	004110776	004110757	54	24	40.000	80.000		
	350	004110767	004110772	004110777	004110758	55	25	45.000	90.000		
	400	004110768	004110773	004110778	004110759	58	24	46.000	138.000		

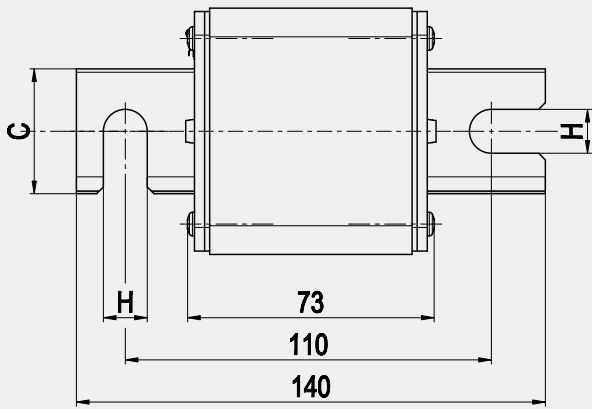


Standard indicator

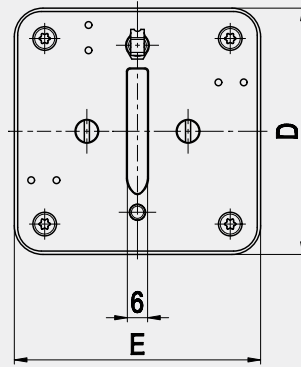
Size	A	B	C	D	E	F	L	N
1	135	24	42	51	51	67	70	74
2	150	30	48	61	61	71	70	74
3	150	37	60	73	73	87	70	74



Pic.2

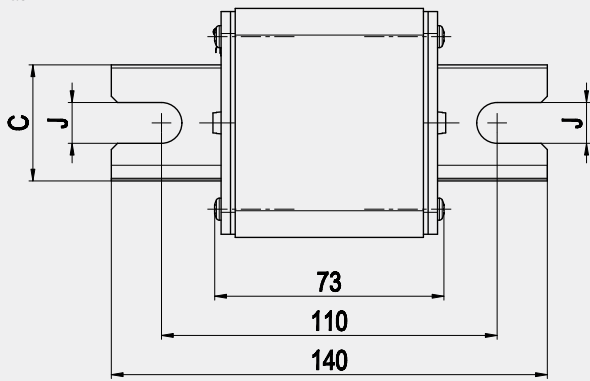


S₁₁₀ screw contact

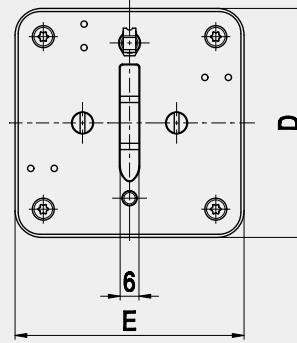


Size	C	E	D	H
2	30	60	60	11
3	37	73	73	11

Pic.3

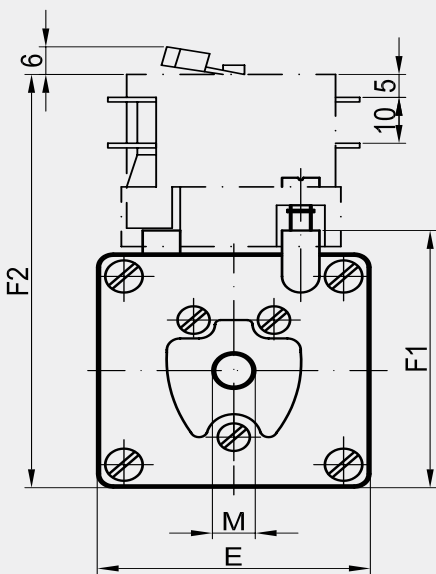


U₁₁₀ screw contact

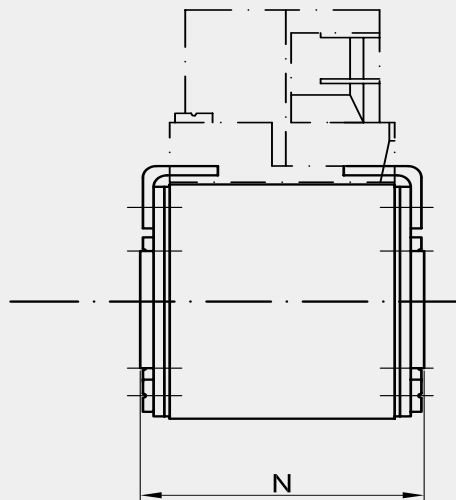


Size	C	J	E	D
2	30	13	60	60
3	37	13	73	73

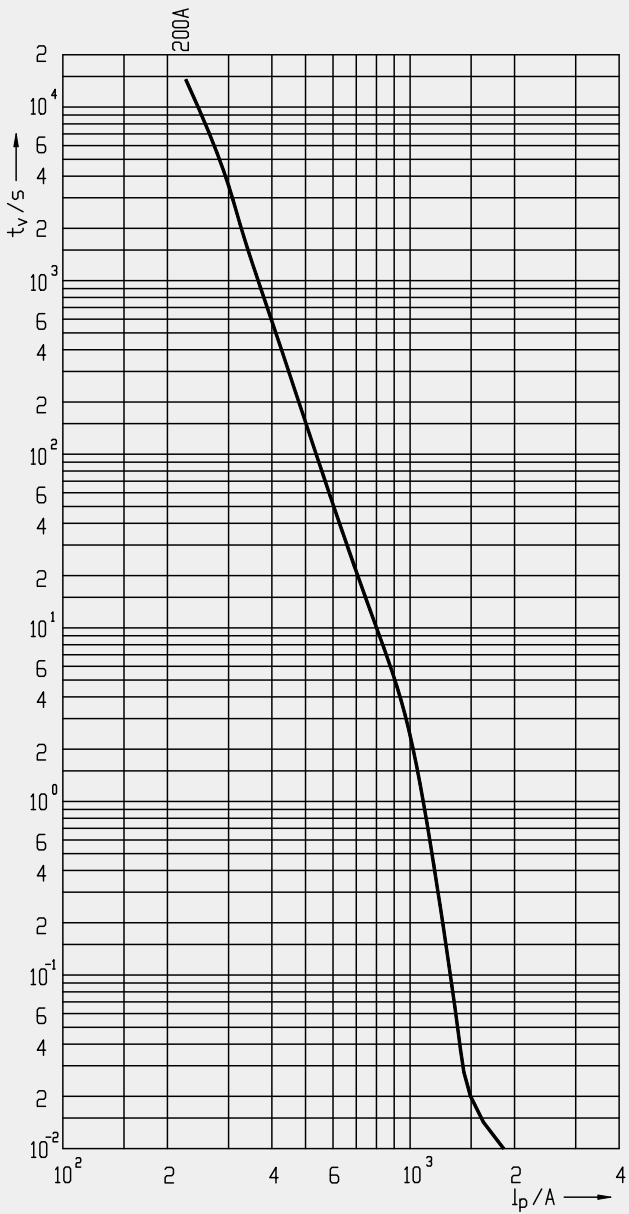
Pic.4



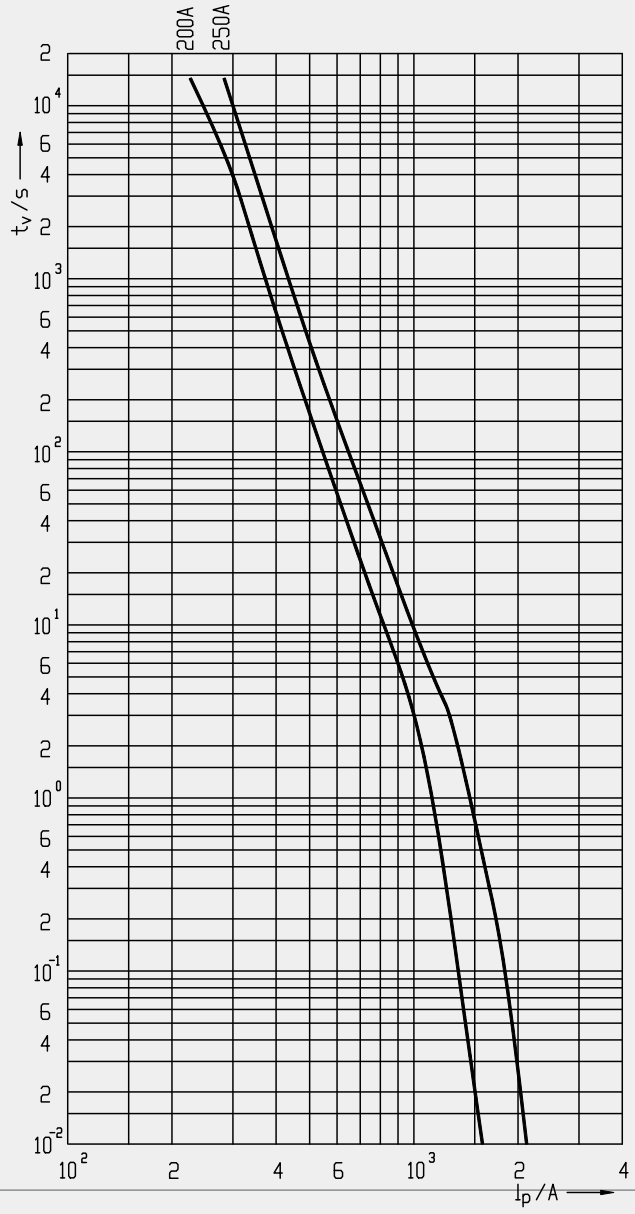
G screw contact



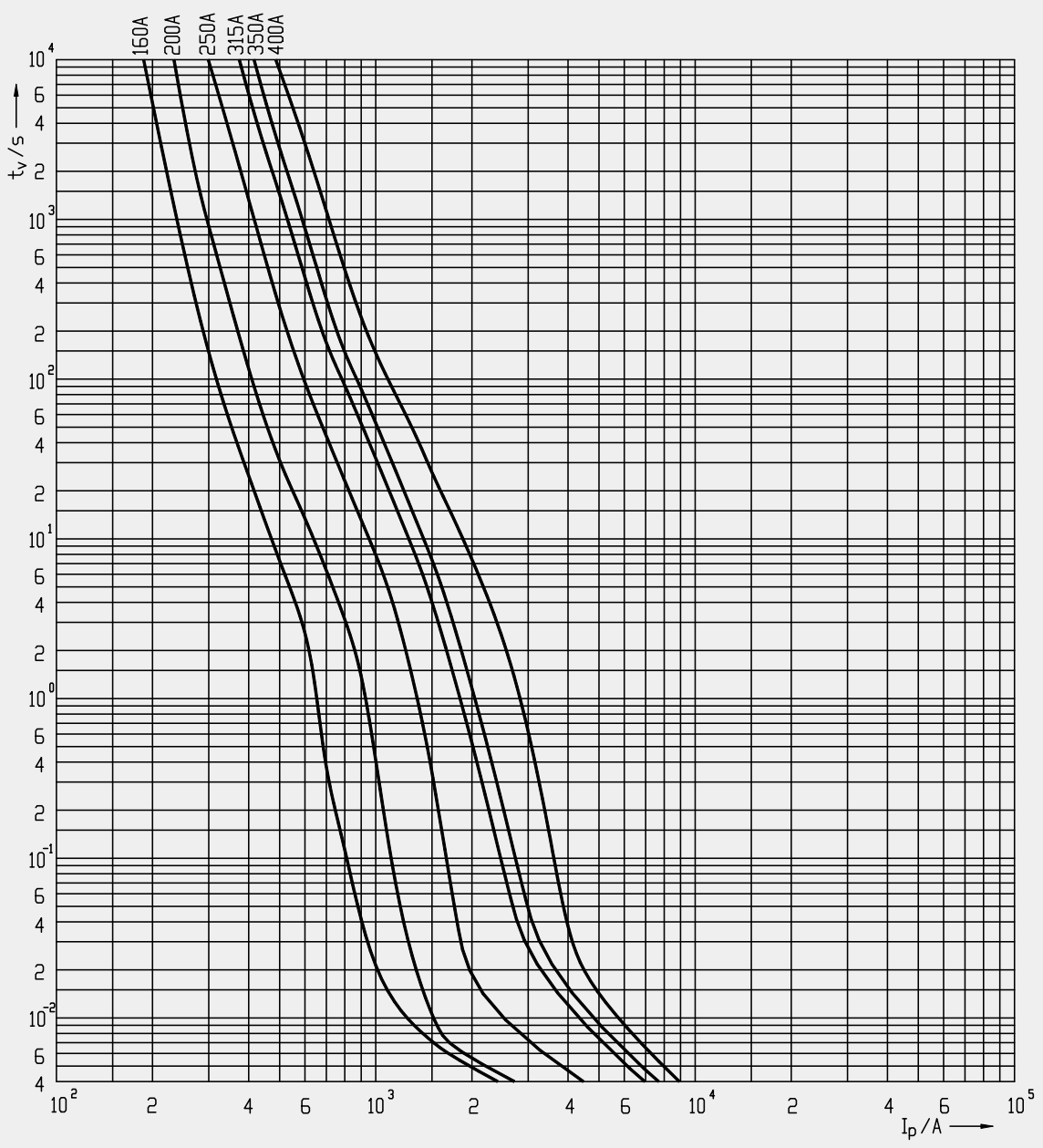
Size	D	E	F1	F2	M	N
2	60	60	65	99	M10	75
3	75	75	80	114	M12	75



NH1
1000V t-I
characteristics



NH2
1000V t-I
characteristics



NH3 1000V t-I characteristics

Green protect - gBat



NH XL Battery fuse link 1500V d.c.

General characteristics	
Rated voltage	1500V d.c. (L/R=3ms)
Rated current	50 - 630A
Breaking capacity	100kA d.c.
Standard	IEC60269
Application	For battery protection. Applied in fuse base PK XL 1500V.

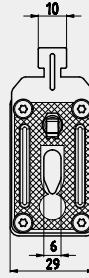
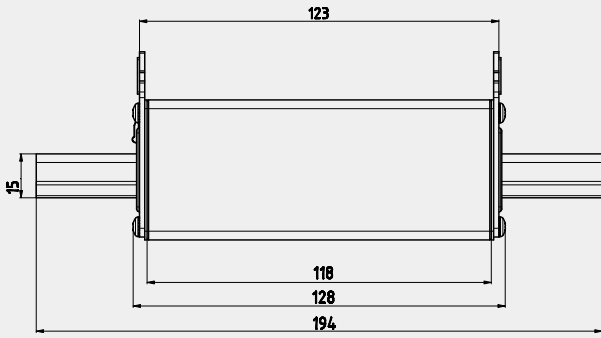


NH gBat 1500V d.c.											
Size	I_n	Standard indicator	S_{170} screw contact	U_{170} screw contact	Power dissipation	Power dissipation $0,7 \times I_n$	Pre-arcing Joule integral L/R=3ms	Operating Joule integral L/R=3ms	For use with	Weight	Pack.
	[A]	pic. 1	pic. 2	pic. 3	[W]	[W]	[A ² s]	[A ² s]		[g]	[pcs]
01XL	50	004110698	004110782	004110788	18	7	1.100	6.500	PK1XL 1500V	450	3/30
	63	004110699	004110783	004110789	22	8,5	2.500	13.000			
	80	004110700	004110784	004110790	21	9	4.500	32.500			
	100	004110701	004110785	004110791	29	11	7.500	54.000			
	125	004110702	004110786	004110792	36	13	9.000	65.000			
	160	004110703	004110787	004110793	46	17	13.000	104.000			
1XL	50	004110650	004110657	004110664	14	6	1.000	8.000	PK1XL 1500V	950	1/15
	63	004110651	004110658	004110665	14	6,2	2.000	13.000			
	80	004110652	004110659	004110666	16	7	6.000	32.000			
	100	004110653	004110660	004110667	19	8,3	12.500	56.000			
	125	004110654	004110661	004110668	22	9,7	19.000	80.000			
	160	004110655	004110662	004110669	30	13,2	24.000	104.000			
2XL	200	004110671	004110673	004110675	36	15,9	50.000	165.000	PK2XL 1500V	1350	1/9
	250	004110672	004110674	004110676	44	19,3	90.000	286.000			
3L	315	004110677	004110682	004110687	57	22,2	60.000	350.000	PK3L 1500V	1970	1/9
	350	004110678	004110683	004110688	61	23,7	70.000	400.000			
	400	004110679	004110684	004110689	67	26,8	80.000	550.000			
	450	004110680	004110685	004110690	75	29	120.000	700.000			
	500	004110681	004110686	004110691	79	44,3	150.000	850.000			
	630	004110779	004110780	004110781	102	40	280.000	1.600.000			

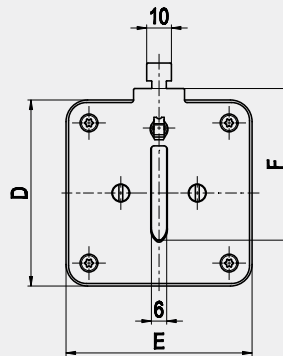
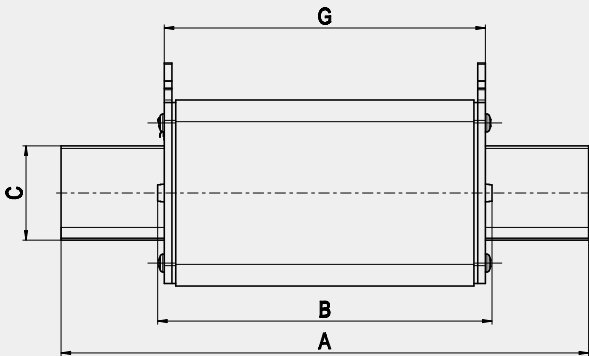
Green protect - gBat

Dimensions

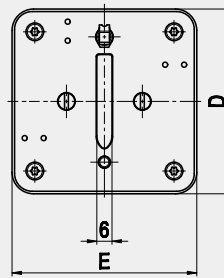
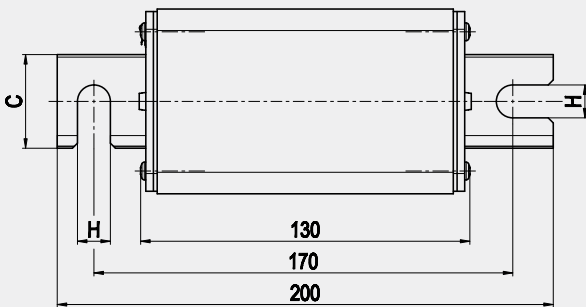
01XL



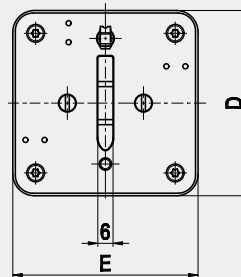
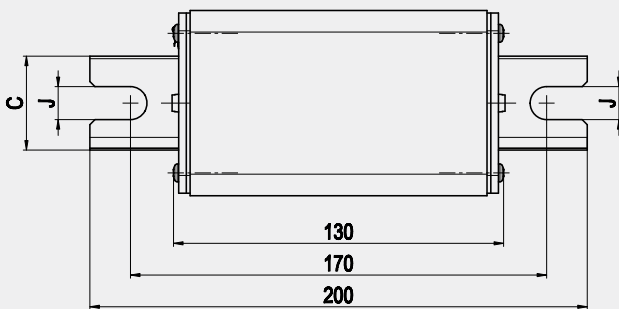
pic. 1



pic. 2



pic. 3



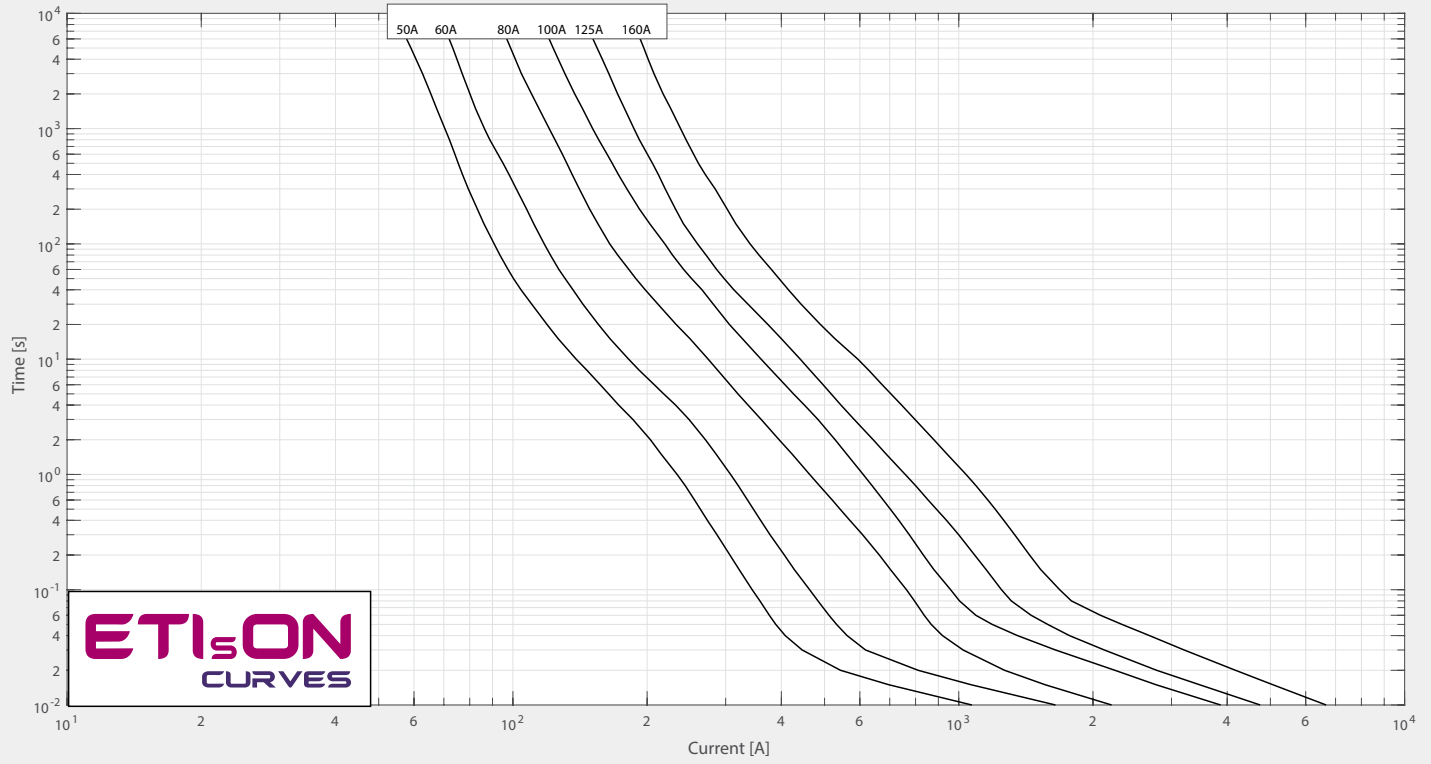
Size	A	B	C	D	E	F	G	H	J
1XL	192	131	24	51	51	43,5	125	11	11
2XL	208	130	30	60	60	48	126	11	13
3L	208	130	37	73	73	60	126	11	13

Green protect - gBat

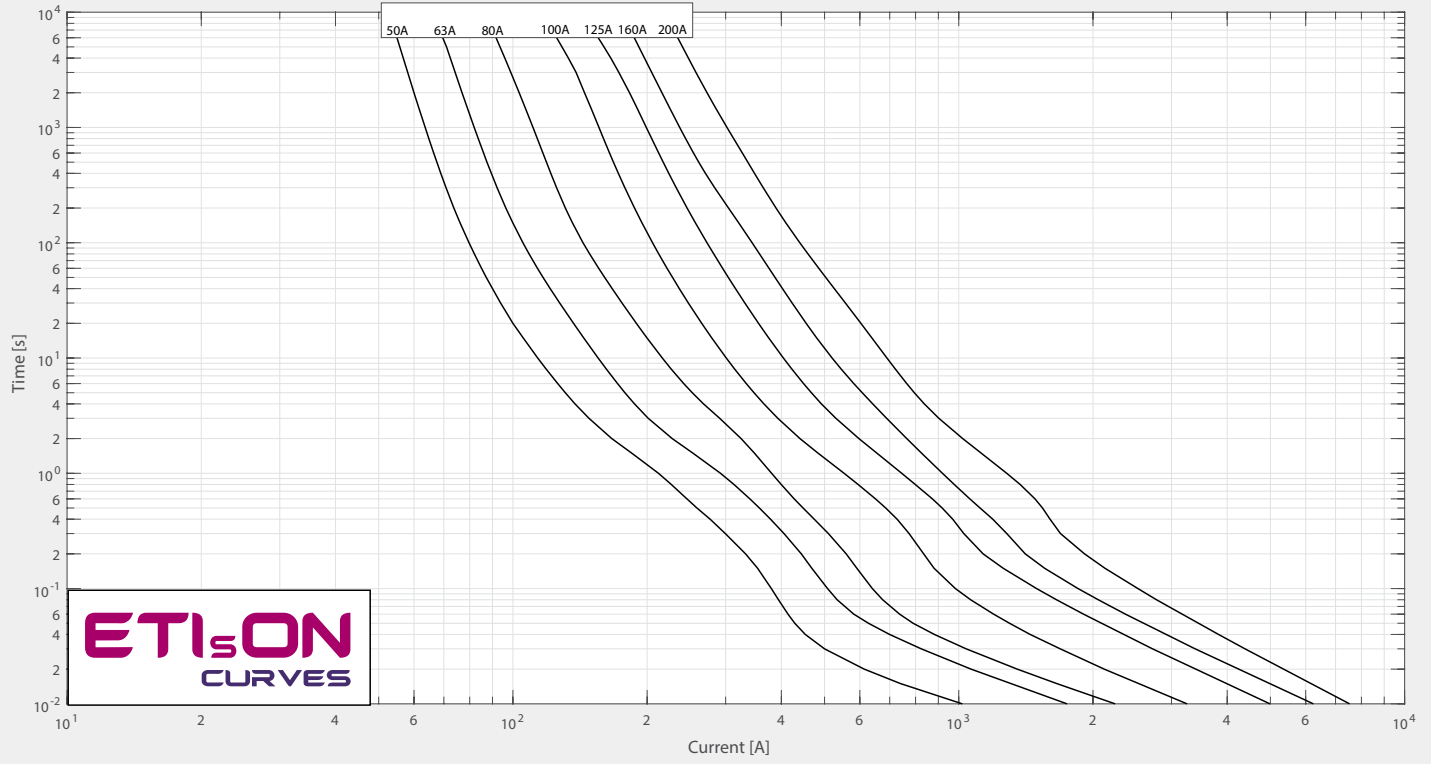


I/t characteristics for NH XL Battery fuses

NH01XL



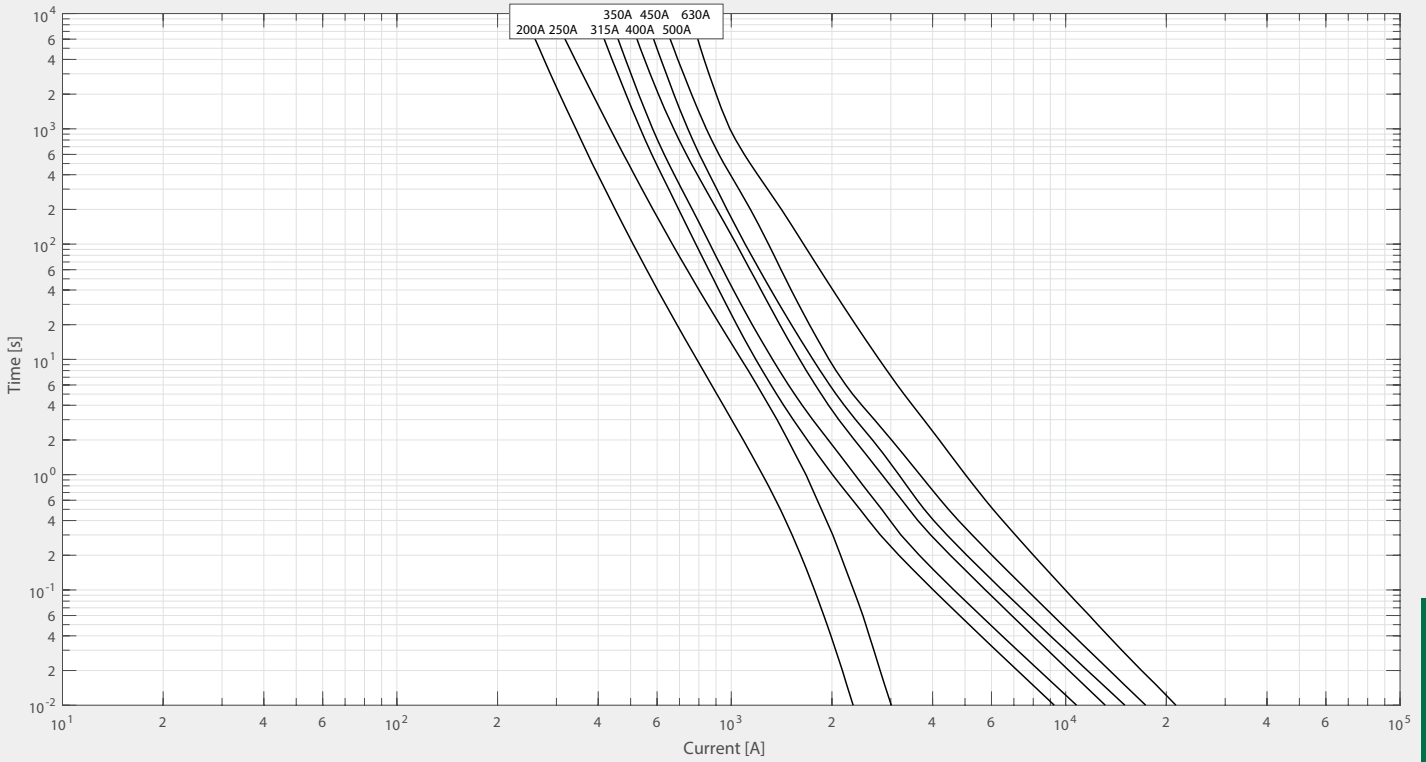
NH1XL



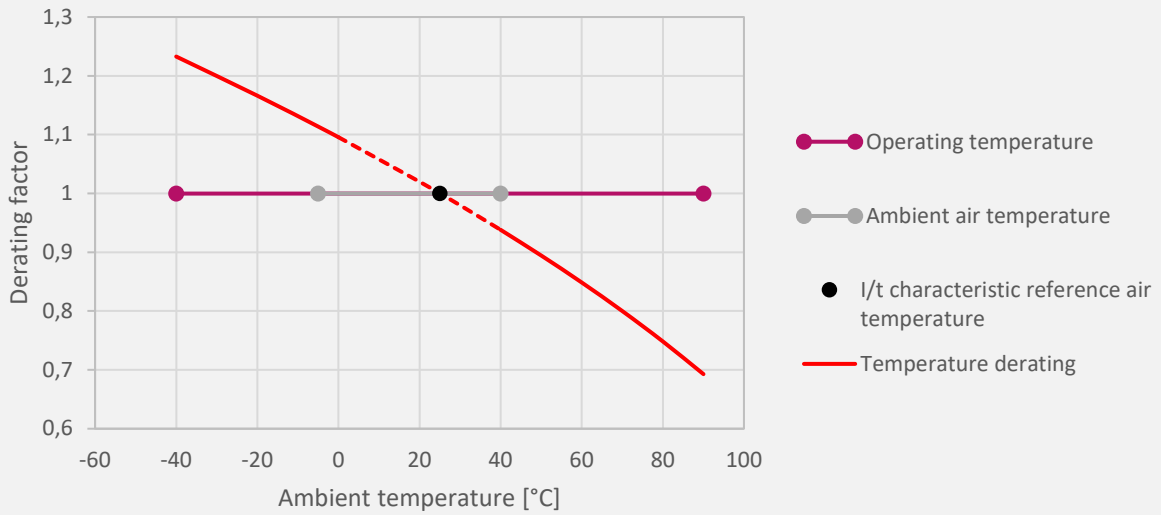
Green protect - gBat



NH2XL, NH3L



Ambient air temperature of fuse-link



Legend:

T_{amb} – Ambient Temperature

TDF – Temperature Derating Factor

I_N – Nominal Current of Fuse-link

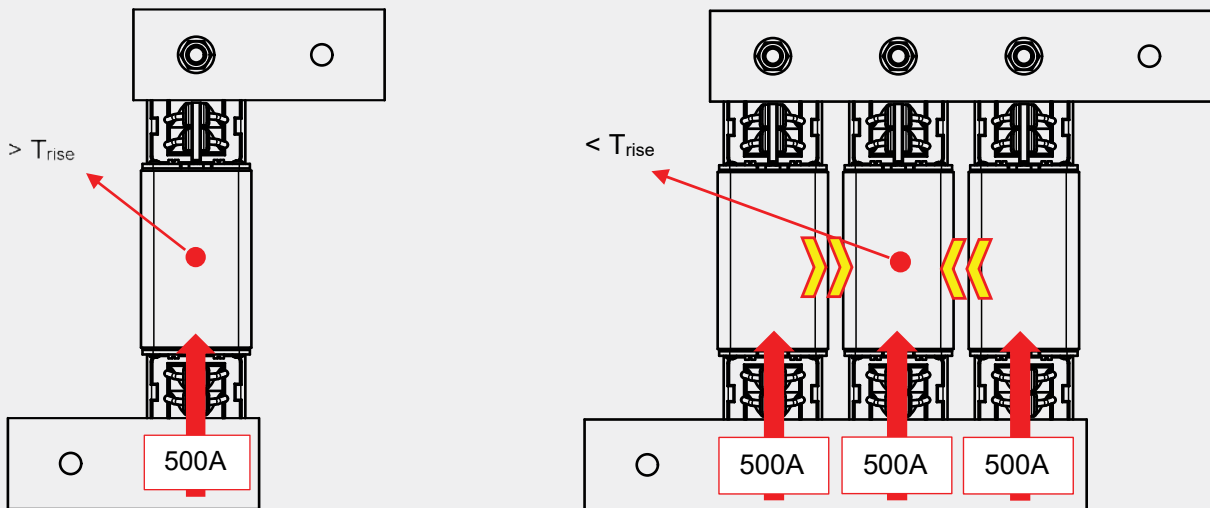
I_{TDF} – Nominal Current Including Temperature Derating Factor

Current calculation: $I_{TDF} = I_N \times TDF$

Parallel connection of fuse-links to increase the rated current

Rules for parallel connection of fuse-links:

- ✘ The fuse-links have to be the same type, size, and rating.
- ✘ The combination of parallel fuses must be selected by the manufacturer.
- ✘ The current rating of parallel-connected fuse-links is lower than the sum of the single fuse-links ($n \times I_n > I_{n \text{ parallel}}$).
- ✘ The current distribution on all parallel fuse-links must be the same.
- ✘ Parallel fuse-links must be connected as prescribed by the manufacturer.
- ✘ The incoming and outgoing connection must have prescribed cross-section.
- ✘ The values of power dissipation are equal to the sum of values of power dissipation of a single fuse link.
- ✘ The pre-arcing Joule integral is approximately equal to $n^2 \times I_{\text{single fuse-link}}^2 t$ *
- ✘ Breaking capacity is not larger than I1 of a single fuse-link.
- ✘ The cut-off current is approximately equal $n \times I_{\text{cut-off [single fuse-link]}}$ *
- ✘ The temperature rise of each parallel fuse-links is higher than the temperature rise of single fuse-link.



Parallel solutions	
Type	Code No.
NH 550V	On request
NH 700V	
NH 800V	
NH 1000V	
NH 1100V	
NH 1500V	