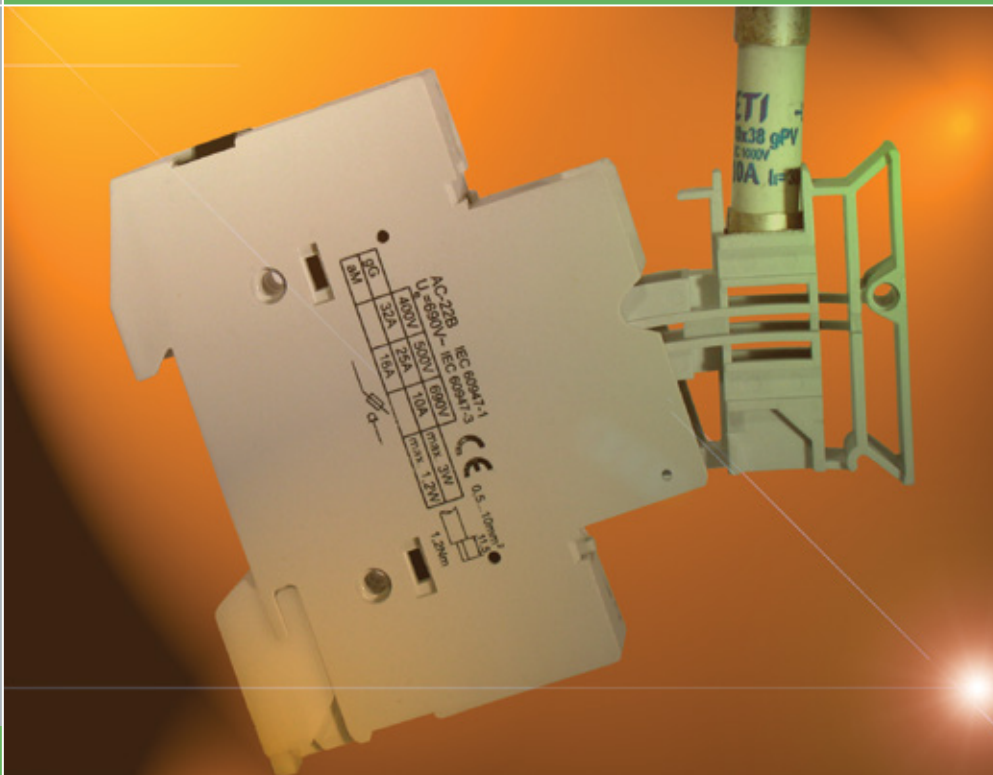


# GREEN PROTECT

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## PROTECTION OF PV SYSTEMS





## PROTECTION OF PHOTOVOLTAIC SYSTEMS

ETI provides high-quality solutions for the complete overcurrent and overvoltage protection of applications in the field of photovoltaic and other renewable energy sources.

Our products are designed for complete protection of:

- DC circuits (overvoltage protection and reverse current protection)
- circuits inside DC/AC inverters (semiconductor protection)
- AC circuits between the inverter and the power grid (overvoltage, overcurrent and anti-islanding protection).

The products are internationally certified and carry several quality marks.

**ETI**  
Green protect

**ETI**  
Green protect

**ETI**  
Green protect

DC  
AC

**Protection of photovoltaic systems**

# DC - distribution and protection components

## Introduction

Photovoltaic systems are composed by photovoltaic panels, cables, fuses, switches, overvoltage arresters and power inverter. Photovoltaic panels utilise the power of sun light to convert photons to DC current.

Electricity generated by solar panels is then fed into a power inverter that converts DC current to AC current. gPV fuse has been developed to protect cable and panel against "reverse" overcurrent.

ETITEC B, C-PV series of over voltage surge protective devices has been developed to protect against direct and indirect lightning discharges and is intended to protect photovoltaic systems.

The circuit topology consists of two varistors stages each protected by a thermal disconnection device.

## Overcurrent protection

■ PV module protection from »DC REVERSE« current on DC side Array with three or more strings of panels:

PV systems that have three or more strings connected in parallel need to have each string protected by fuses.

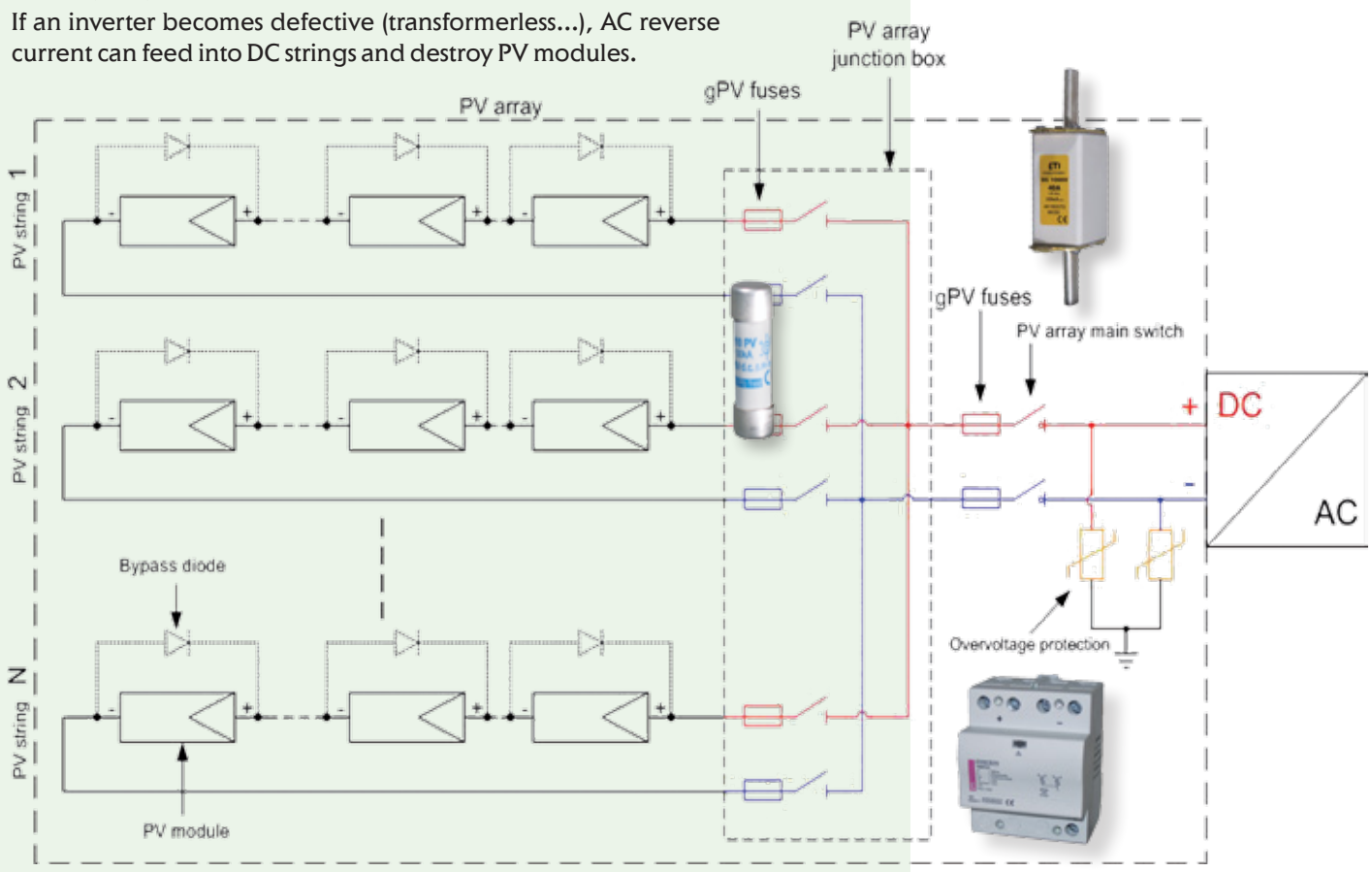
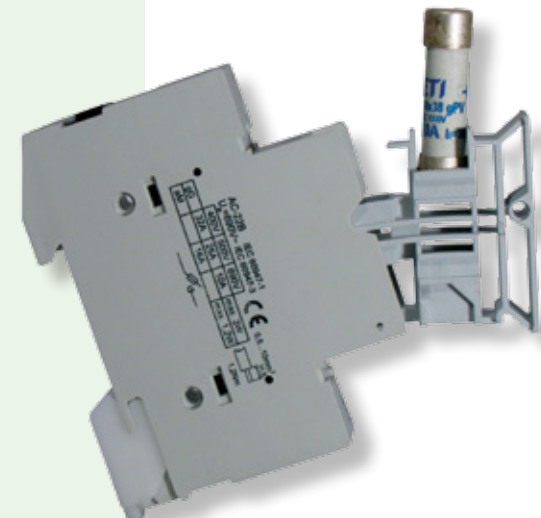
Systems that have less than three strings will not generate enough fault current to damage the conductors/solar panels.

Normally there are two gPV fuses connected on each string (+ and - pole), that protect conductors/solar panels from damage and eliminate any safety hazards.

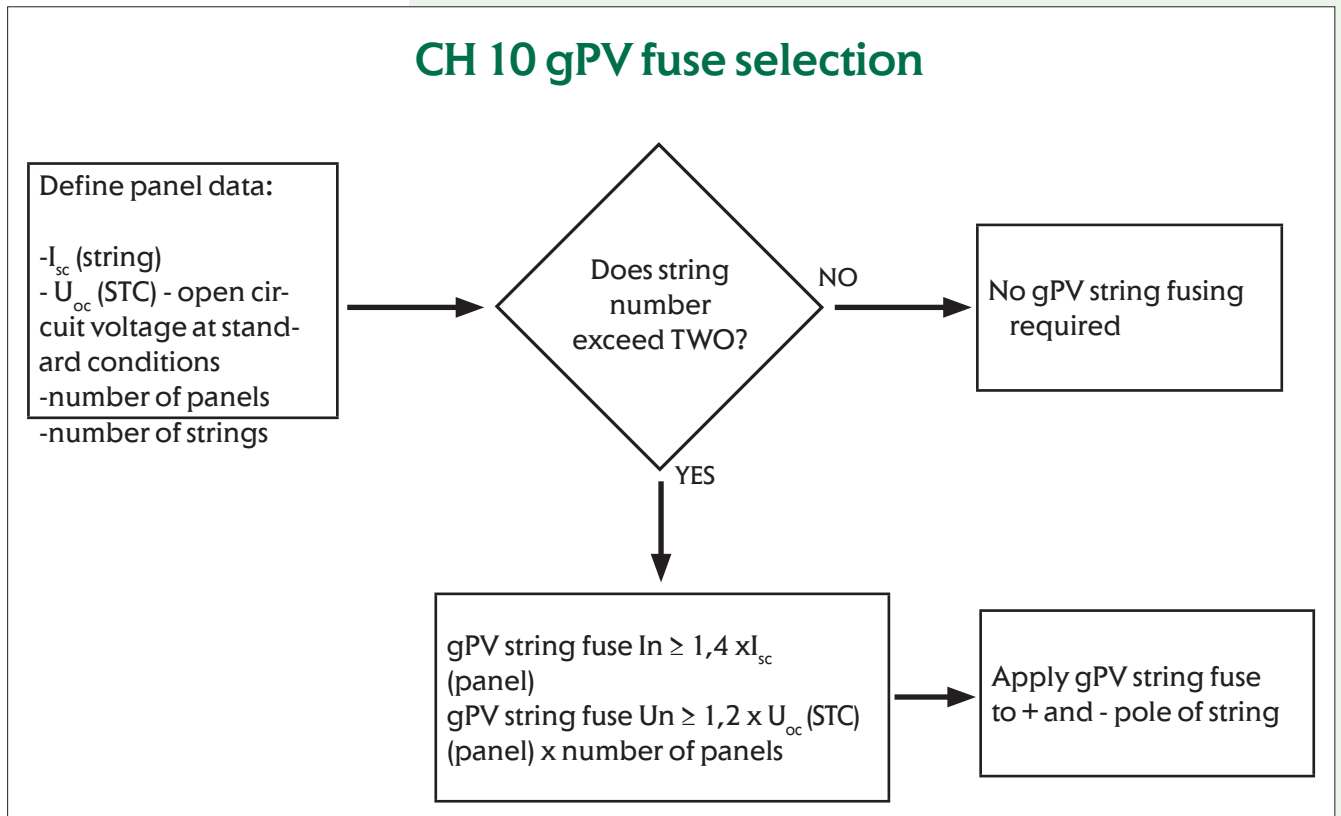
Fuses isolate the faulted string. The rest of PV system can continue to generate electricity.

■ PV module protection from »AC REVERSE« current caused by defective inverter

If an inverter becomes defective (transformerless...), AC reverse current can feed into DC strings and destroy PV modules.

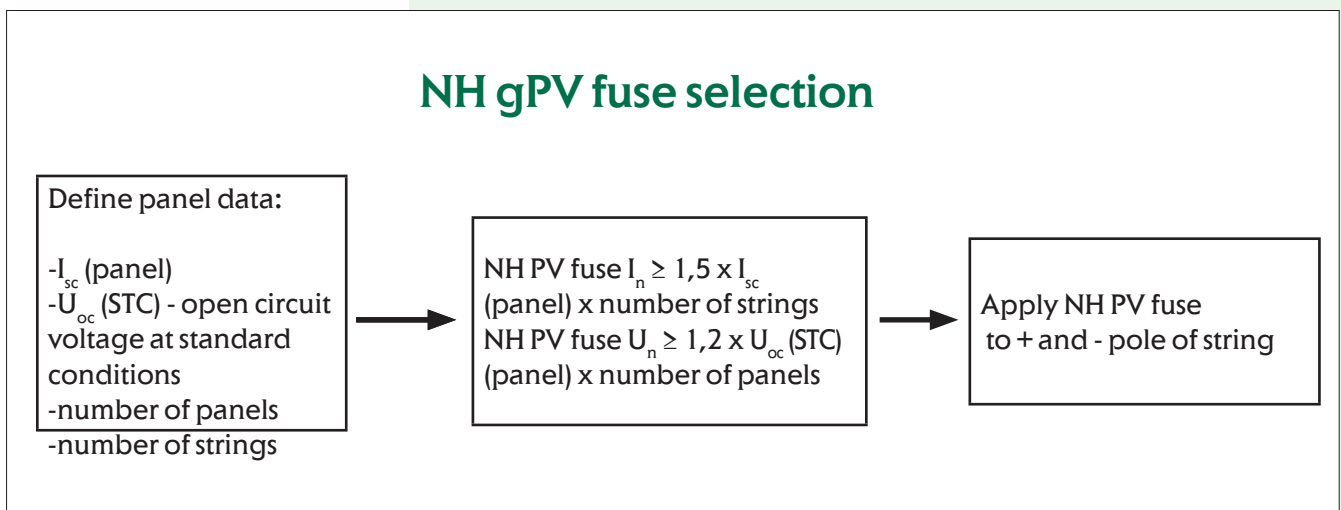


## CH 10 gPV fuse selection



Derating factor 1,4 is defined for ambient temperature max. 45 °C .  
 Cable cross-section derating factor is not included!

## NH gPV fuse selection



Derating factor 1,5 is defined for ambient temperature max. 45 °C  
 Cable cross-section derating factor is not included!

ETI as one of the most important European producer of overcurrent protection equipment and devices participating in many working groups for standards development at International Electrotechnical Commission (IEC). ETI is member of maintenance team MT9 belonging to the 32B group, working on the part 6 of the IEC 60269 dealing with supplementary requirements for fuse-links for the overcurrent protection of solar photovoltaic energy systems.

gPV fuse link must be selected acc. standard IEC 62548

# CH 10 gPV 1000V - Fuse-links

## General characteristics UL file: E347771

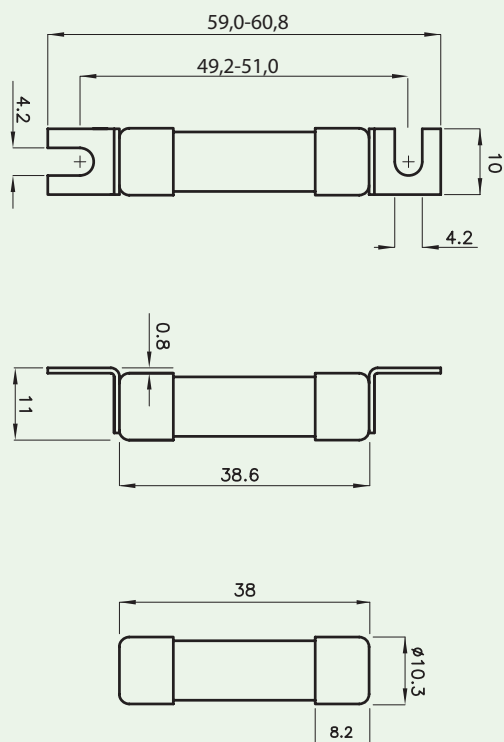
Rated voltage	1000V d.c. L/R=2ms
Breaking capacity	10kA d.c. / 30kA d.c.
Standards	UL 2579, UL 248-1
Application	For protection of photovoltaic modules.



## CH 10x38 gPV

Size	$I_n$ [A]	Code No. "standard contacts" 10kA UL	Code No. "standard contacts" 30kA IEC	Code No. "type SU contacts" 30kA IEC	Pre-arcing Joule integral [A <sup>2</sup> s] L/R=2ms	Operating Joule integral [A <sup>2</sup> s] L/R=2ms	Power dissipation [0,7 x I <sub>n</sub> ] <sup>2</sup> P <sub>d</sub> [W]	Power dissipation [I <sub>n</sub> ] <sup>2</sup> P <sub>d</sub> [W]	Weight [g]	Packaging [pcs]
10 x 38	0,5		002625134	002625131	0,016	0,068	0,2	0,52	10/12	10/500 SU:10/380
	1		002625138	002625129	1,5	3	0,42	1,0		
	2	002625101	002625065	002625115	1,7	2,3	0,47	1,12		
	3	002625100	002625067	002625113	2,8	5,4	0,65	1,6		
	3,5	002625135	002625068	002625127	2,5	7	0,57	1,4		
	4	002625102	002625069	002625116	3,9	11,7	0,52	1,25		
	5	002625111	002625070	002625124	8	21	0,63	1,49		
	6	002625103	002625071	002625117	10,6	34,6	0,73	1,75		
	7	002625110	002625072	002625114	16	60	0,74	1,74		
	8	002625104	002625073	002625118	17	65	0,8	1,9		
	10	002625105	002625075	002625119	8,3	33	0,97	2,4		
	12	002625106	002625077	002625120	22	73	0,8	1,9		
	13	002625137	002625078	002625128	21	70	1,0	2,3		
	14	002625136	002625079	002625126	28	92	1,3	3,0		
	15	002625112	002625080	002625125	49	145	1,0	2,2		
	16	002625107	002625081	002625121	48	147	1,1	2,6		
	20	002625108	002625085	002625122	86	245	1,3	3,2		
25*		002625109	002625123	125	289	1,65	4,1			
25		002625139	002625140	110	470	1,65	4,1			

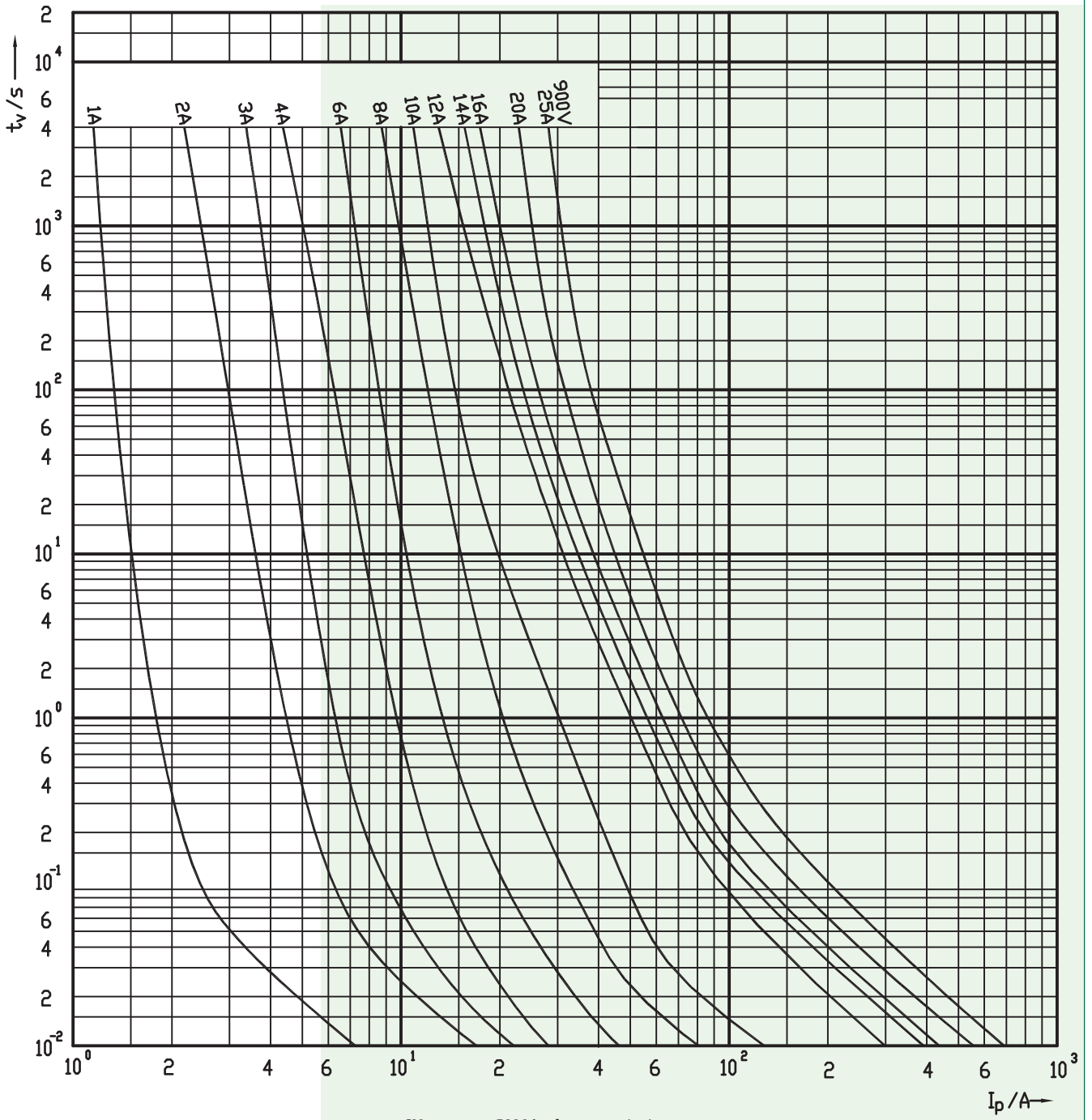
\* 900V d.c.



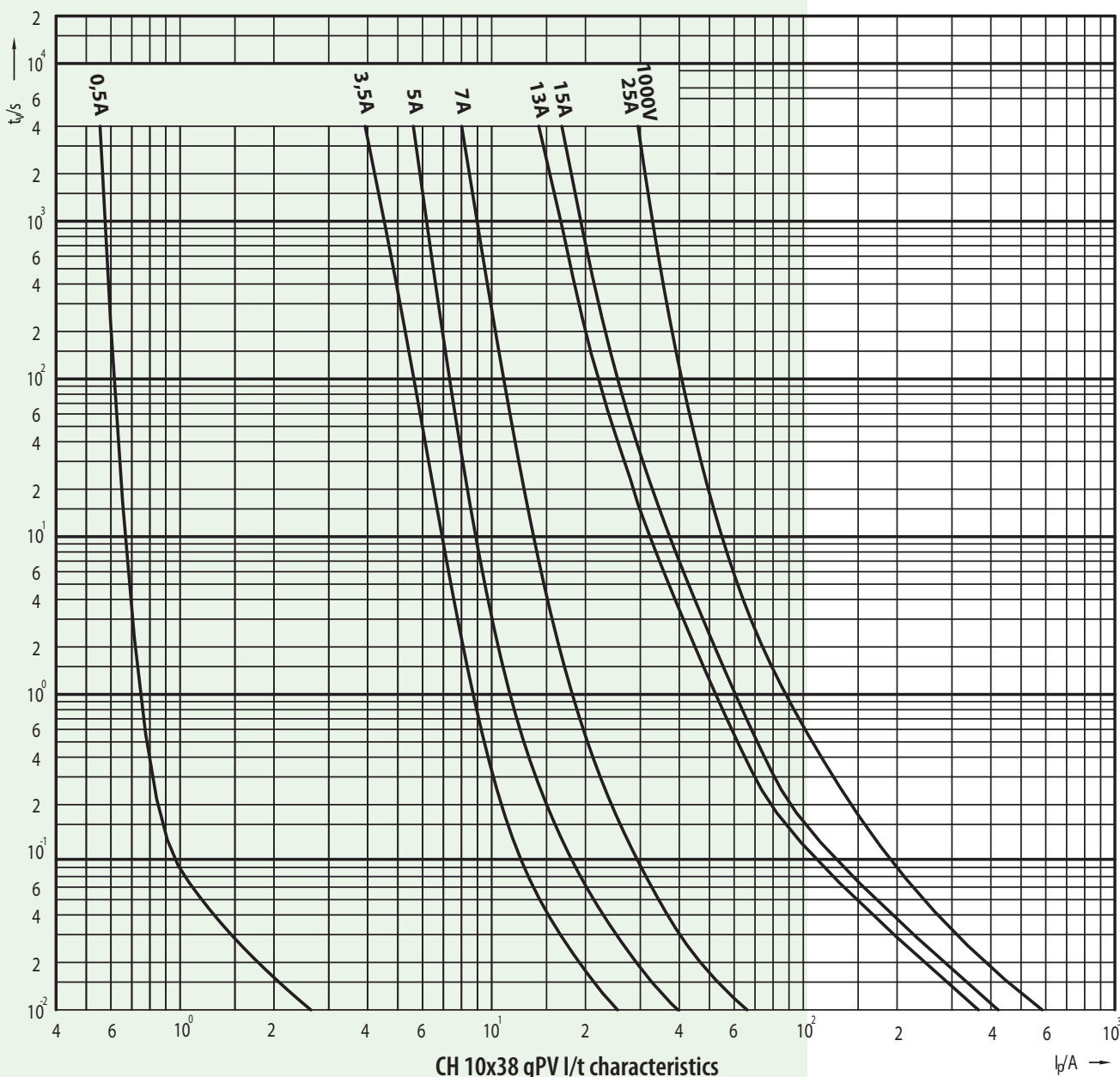
Standard Contacts



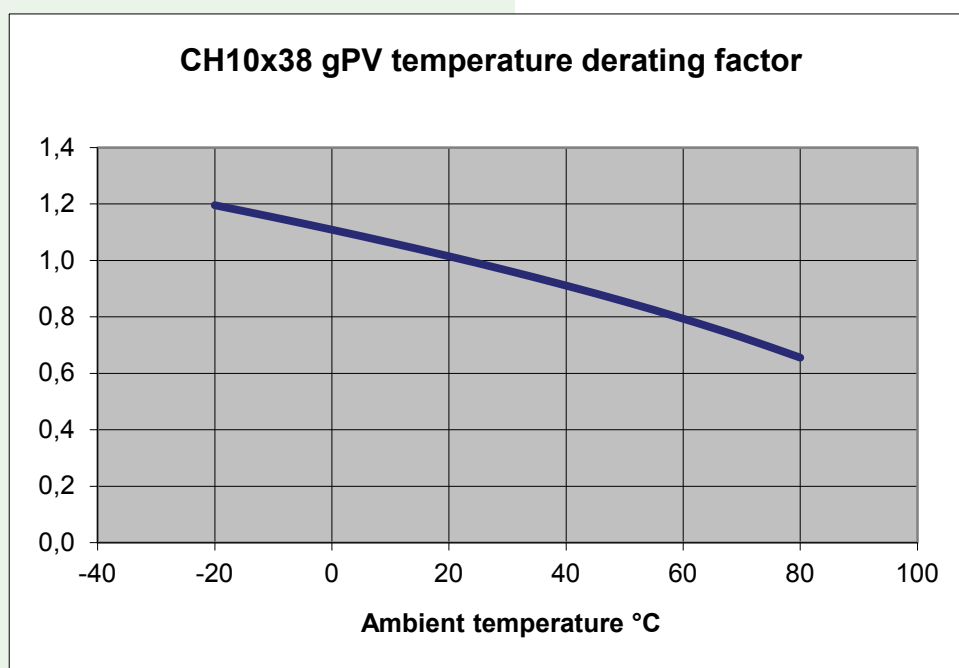
Type SU Contacts



CH 10x38 gPV I/t characteristics



Tamb (°C)	A1
-20	1,196
-10	1,153
0	1,109
10	1,063
20	1,015
30	0,964
40	0,911
50	0,854
60	0,794
70	0,728
80	0,656



# CH 10x85 gPV 1500V - Fuse-links



General characteristics		UL file: E347771
Rated voltage	1500V d.c. L/R=2ms	
Breaking capacity	10kA d.c. / 30kA d.c.	
Standards	UL 2579, UL 248-1	
Application	For protection of photovoltaic modules.	

CH 10x85 gPV										
Size	$I_n$ [A]	Code No. "standard contacts" 10kA UL	Code No. "standard contacts" 30kA IEC	Code No. "type SU contacts" 30kA IEC	Pre-arcing Joule integral [A <sup>2</sup> s] L/R=1ms	Operating Joule integral [A <sup>2</sup> s] L/R=1ms	Power dissipation [0,7 x I <sub>n</sub> <sup>2</sup> ] P <sub>d</sub> [W]	Power dissipation [I <sub>n</sub> <sup>2</sup> ] P <sub>d</sub> [W]	Weight [g]	Packaging [pcs]
10 x 85	2		002625200	002625210	1,5	2,1	1,0	2,4	15/17	10/210 SU:10/160
	4	002625201	002625274	002625211	10,2	15,1	1,1	2,7		
	5	002625239	002625276	002625209	10,6	33,2	1,2	3,0		
	6	002625202	002625277	002625212	23,3	50,4	1,2	3,0		
	8	002625203	002625279	002625213	46	109	1,5	3,6		
	10	002625204	002625280	002625214	63	191	1,6	3,7		
	12	002625205	002625282	002625215	24	118	1,4	3,3		
	15	002625240	002625285	002625219	40,6	161	1,4	3,6		
	16	002625206	002625286	002625216	35	164	1,6	3,7		
	20*	002625207	002625287	002625217	39	209	1,7	4,0		
	20		002626234		38,6	431,3	2	4,8		
	25*	002625208	002625288	002625218	72	504	2,1	5,2		

\* 1200V d.c.

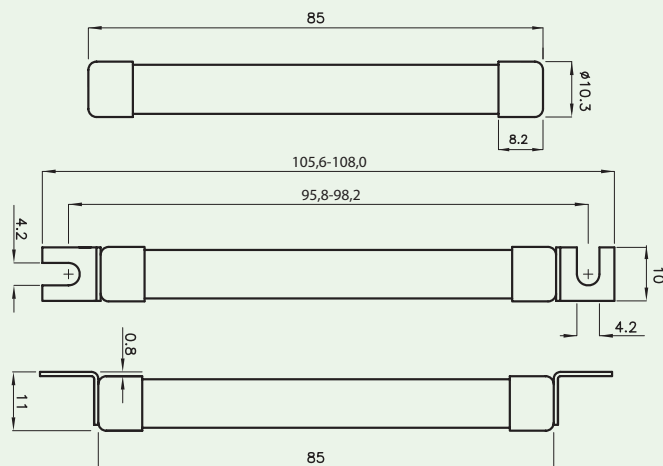
\*\* 25A and 30A 1500V d.c. fuse links are currently being developed, for more information, please contact our sales



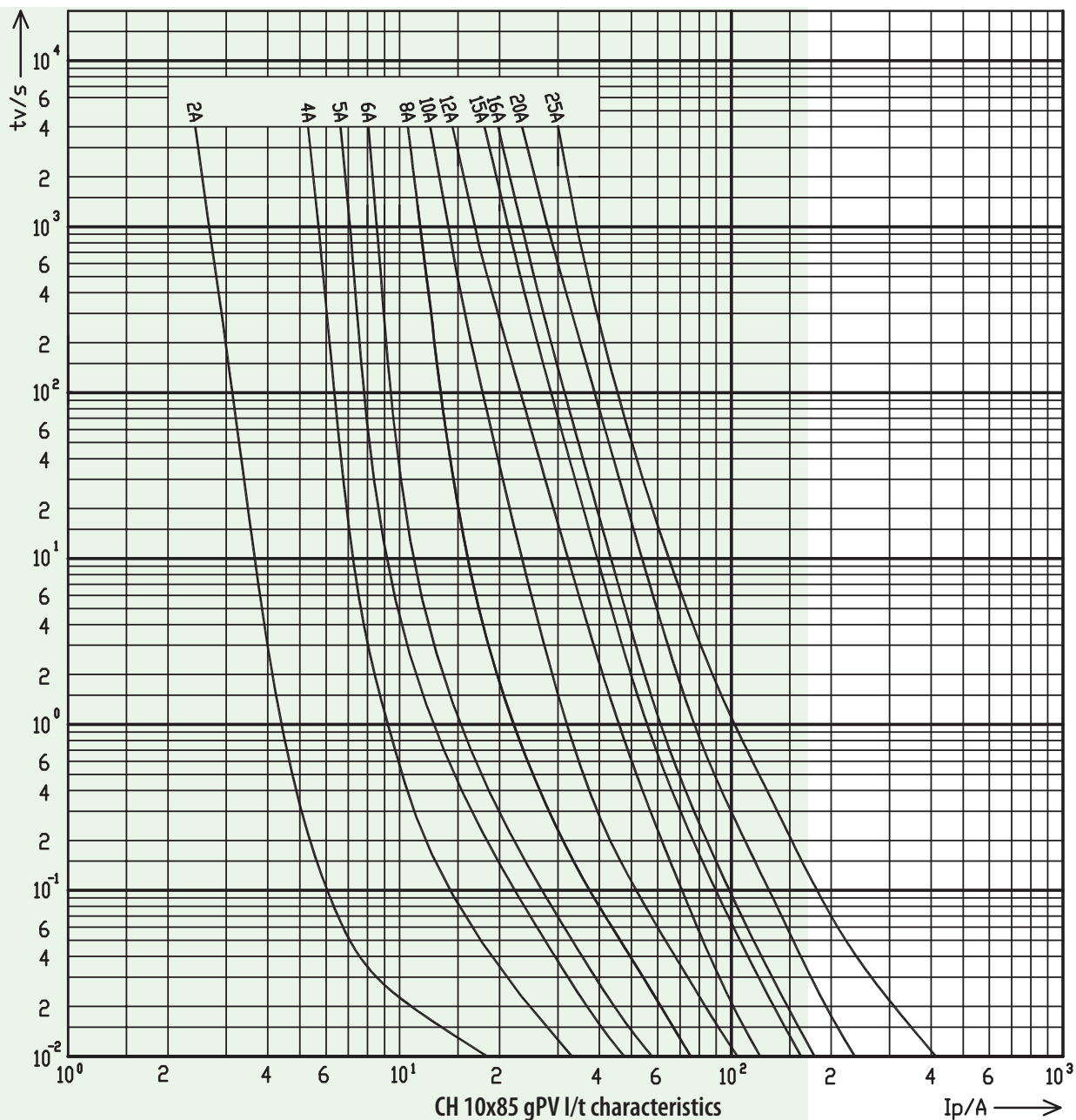
Type SU Contacts



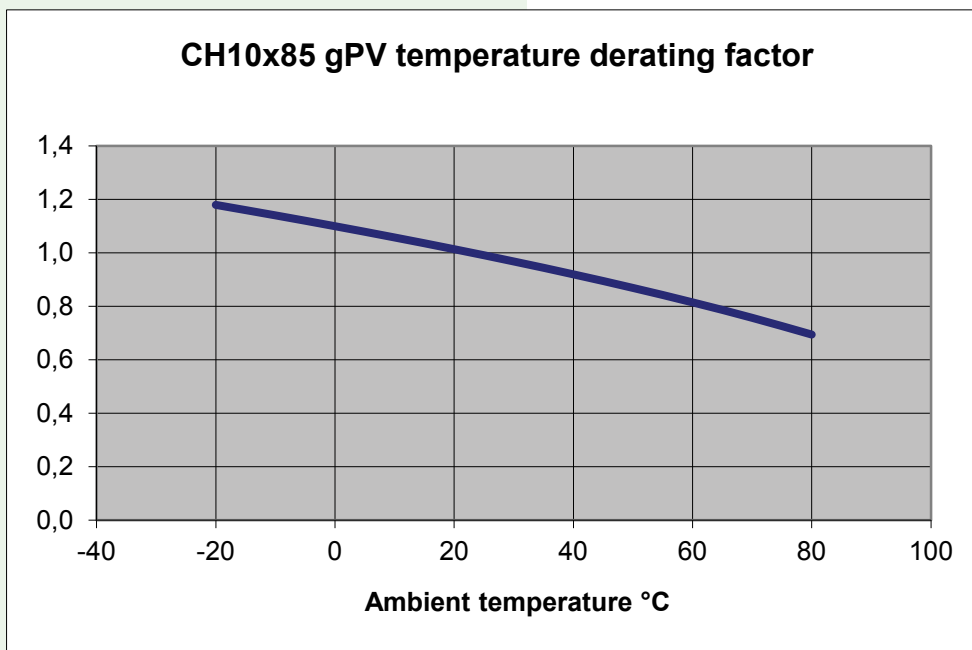
Standard Contacts







Tamb (°C)	A1
-20	1,179
-10	1,140
0	1,100
10	1,057
20	1,014
30	0,968
40	0,919
50	0,869
60	0,815
70	0,757
80	0,694



# CH 14x51 gPV 1000V, 1100V - Fuse-links



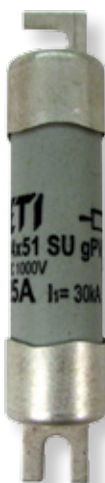
### General characteristics

Rated voltage	1000V d.c. L/R=2ms (1100V d.c. for 002637185)
Breaking capacity	10kA d.c. (30kA d.c. for 002637185)
Standards	IEC 60269-6 ed 1.0 (2010-9)
Application	For protection of photovoltaic modules

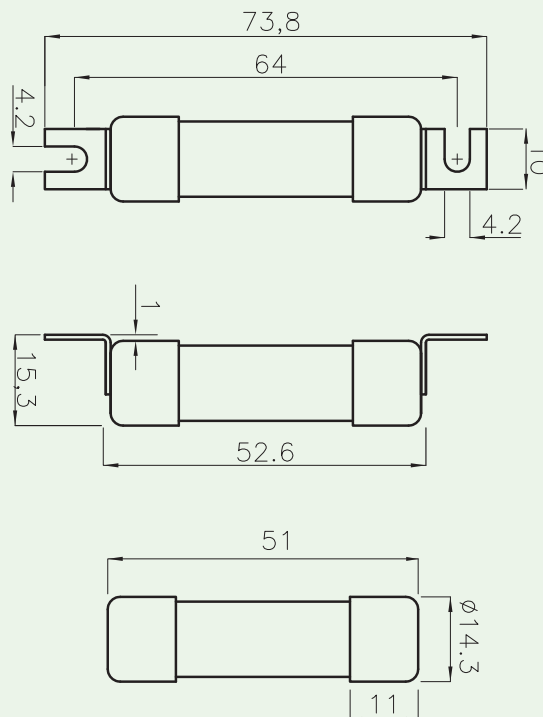
CH 14 gPV									
Size	$I_n$ [A]	Code No. "standard contacts"	Code No. "type SU contacts"	Pre-arcing Joule integral [A <sup>2</sup> s] L/R=2ms	Operating Joule integral [A <sup>2</sup> s] L/R=2ms	Power dissipation [0,7 x I <sub>n</sub> ] P <sub>d</sub> [W]	Power dissipation [I <sub>n</sub> ] P <sub>d</sub> [W]	Weight [g]	Packaging [pcs]
14x51	16	002637105		55	155	1,4	3,1	18,6	10/200
	16		002637305	55	155	1,4	3,1	20,6	10/260
	16	002637185*		55	220	1,4	3,1	18,6	10/200
	20	002637107		130	330	1,5	3,2	18,7	10/200
	20		002637307	130	330	1,5	3,2	20,7	10/260
	25	002637109		180	360	2	4	18,7	10/200
	25		002637309	180	360	2	4	20,7	10/260
	32	002637111		297	1290	2,1	5,1	18,9	10/200
	32		002637311	297	1290	2,1	5,1	20,9	10/260
	36	002637115		450	1190	2,3	5,6	18,9	10/200
36		002637315	450	1190	2,3	5,6	20,9	10/260	

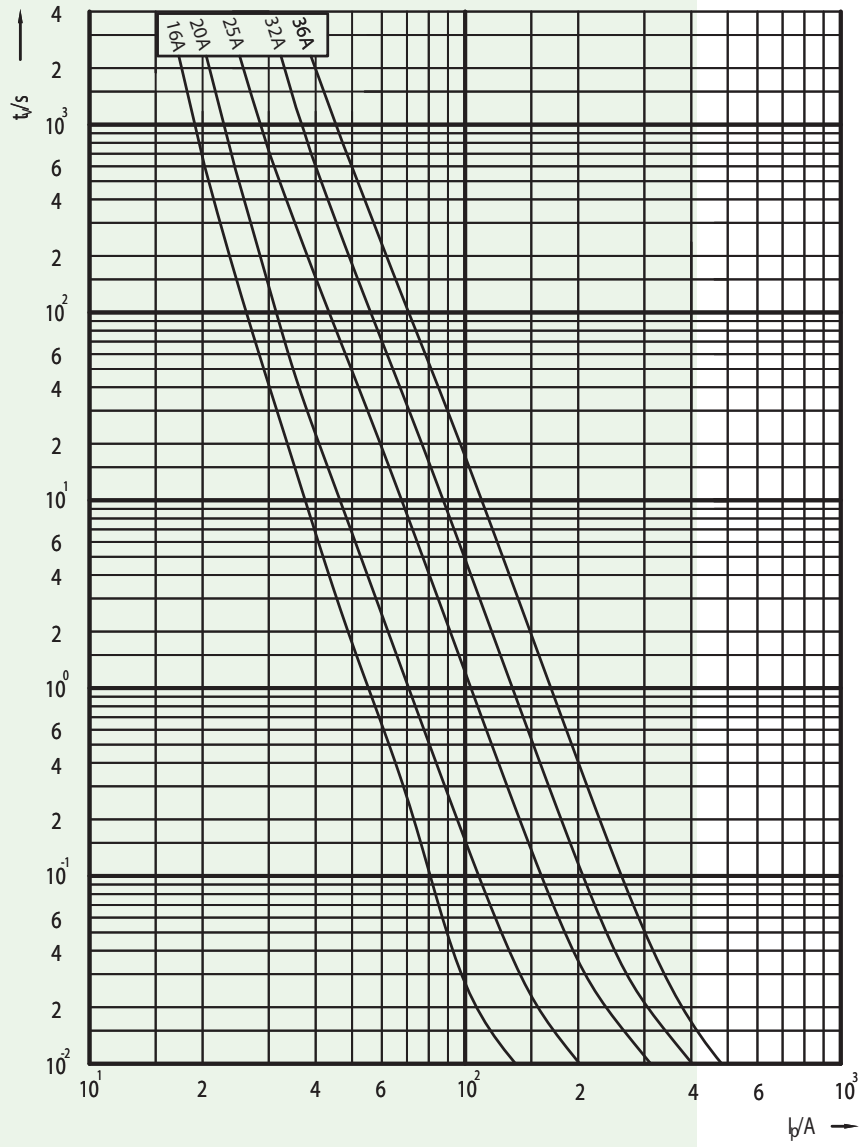
\*Rated voltage: 1100V d.c. L/R=2ms  
Breaking capacity: 30kA d.c.

Power dissipation is measured on an open fuse base, according to the requirements of IEC 60269-6.



Type SU Contacts

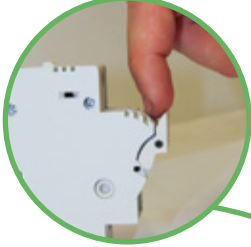




CH 14 PV I/t characteristics

## Advantages of photovoltaic fuseholder EFH

→ More space for finger to open fuse carrier

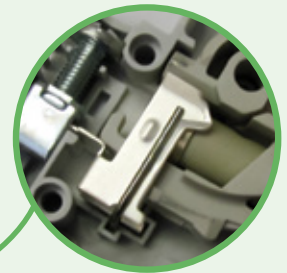


→ Compliance with IEC 60947-1, IEC 60947-3, UL 4248-1, UL 4248-18, and UL 486E



→ Mounting on standard DIN 35 mm rail (DIN EN60715)

→ All contact surfaces are silver plated



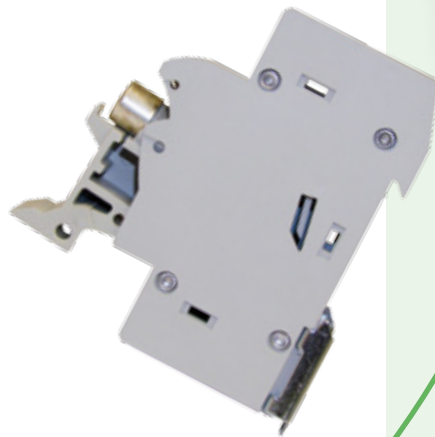
→ Complete protection against touch according to IP20



→ Possibility of sealing in ON or OFF positions



→ All plastic parts are made of material resistant to extremely high temperatures. Fuse carrier assures that a fuse link is not in touch with a housing



→ For both sizes a **version with electronic indicator** is available. Marked with **L (LED)**, the EFH has a built-in LED diode which blinks after the fuse-link operates. Operating voltage ranges from 50V to 1000V d.c.



→ Modular design – it is possible to assemble multi-pole versions at the building site

# EFH 10 DC - Photovoltaic fuseholder

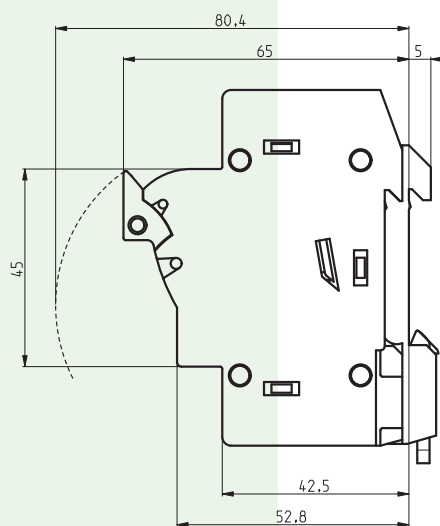
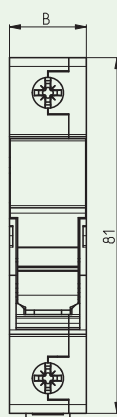
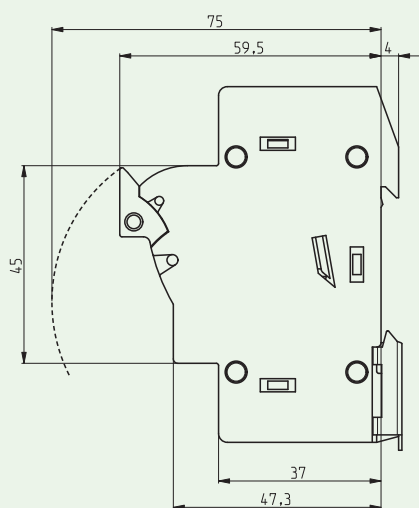
## General characteristics

Rated voltage	1000V d.c.
Rated current	max. 25A
Max. fuse link power dissipation	3 W
Cross section of connecting wire	1 mm <sup>2</sup> - 25 mm <sup>2</sup>
Pole build-in width	17,5 mm
Mounting on the rail	EN 60715 - 35mm rail
Utilization category	DC-20B (Do not operate under load)
Rated torque	2Nm
Standards Fuse-links	IEC/EN 60269-2, IEC/EN 60269-6, UL 284-4
Standards - Fuse holder	IEC 60947-1, IEC 60947-3, UL 4248-1, UL 4248-18, UL 486E, CSA C22.2 No.65



## EFH 10 DC

Number of poles	U <sub>e</sub> /U <sub>i</sub> [V]	I <sub>max</sub> [A]	Code No.	Indicator	Adapter	Weight [g]	Packaging [pcs]	
1 p	1000V d.c.	25A	002540201	-	-	63	12/108	
			002540211	LED	-	64		
			002540501	-	✓	68		
			002540511	LED	✓	69		
2 p		25A	002540203	-	-	124		6/54
			002540213	LED	-	125		
			002540503	-	✓	134		
			002540513	LED	✓	135		



Version with adapter

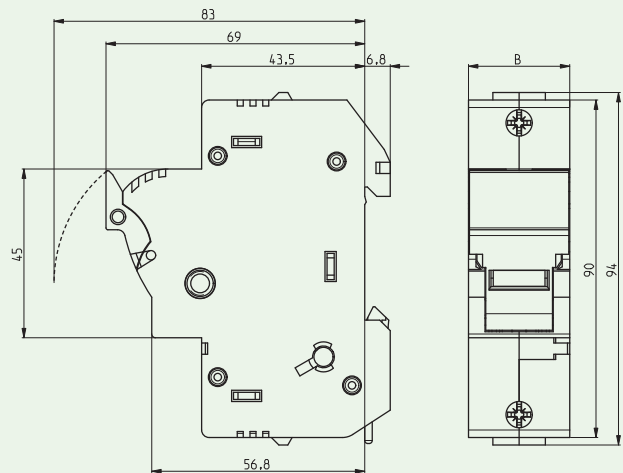
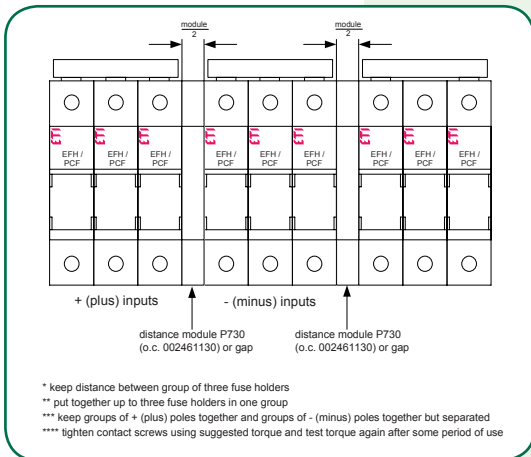
Type	Dimensions [mm]
	B
1 pole	17,5
2 pole	35

# EFH 14 DC - Photovoltaic fuseholder



General characteristics	
Rated voltage	1000V d.c., 1100V d.c.
Rated current	max. 50A
Max. fuse link power dissipation	5 W
Cross section of connecting wire	1,5 mm <sup>2</sup> - 35 mm <sup>2</sup>
Pole build-in width	27 mm
Mouting on the rail	EN 60715 - 35mm rail
Utilization category	DC-20B (Do not operate under load)
Rated torque	2,5 - 3Nm
Standards Fuse-links	IEC/EN 60269-2, IEC/EN 60269-6, UL 284-4
Standards - Fuse holder	IEC 60947-1, IEC 60947-3, UL 4248-1, UL 4248-18, UL 486E, CSA C22.2 No.65

EFH 14 DC						
Number of poles	U <sub>e</sub> /U <sub>i</sub> [V]	I <sub>max</sub> [A]	Code No.	Indicator	Weight [g]	Packaging [pcs]
1 pole	1000V d.c.	50A	002560201	-	102	12/96
			002560211	LED	103	
2 pole		50A	002560203	-	206	6/48
			002560213	LED	208	
1 pole	1100V d.c.	50A	002560206*	-	102	12/96
			002560214*	LED	103	
2 pole		50A	002560207*	-	206	6/48
			002560215*	LED	208	



Type	Dimensions [mm]
	B
1 pole	27
2 pole	54

# Technical specifications for photovoltaic fuseholder

Technical data				
	EFH 10 DC		EFH 14 DC	
Fuse type	CH 10x38 PV		CH 14x51 PV	
	IEC	UL	IEC	UL
Versions	Without indicator, LED indicator			
Number of poles	1p, 2p			
Rated operational voltage Ue	1000V d.c.			
Rated operational current Ie	25A		50A	
Rated conditional short-circuit current	30kA	10kA	30kA	10kA
Rated insulation voltage Ui	1000V		1000V	
Rated imp. withstand voltage Uimp	8kV		8kV	
Required insulation temperature rating	60°C		60°C	
Max power dissipation of the fuse-link (W)	3W		5W	
Derating factor of current In for different ambient temperatures	20°	1		
	30°	0,95		
	40°	0,9		
	50°	0,8		
	60°	0,7		
	70°	0,5		
Derating factor of current In for side by side mounting fuse holders (nr. of poles)	1-4	1		
	5-6	0,8		
	7-9	0,7		
	≥10	0,6		
LED indicator operating range	80V-1000V d.c.			
Utilization category	DC-20B (Do not operate under load)			
Operational performance (cycles with current)	0		0	
Operational performance (cycles without current)	2000		2000	
Inclined Plane Tracking (IPT)	60min at 1kV		60min at 1kV	
Humidity	90% at 20°C		90% at 20°C	
Operating ambient temperature	-5°C ... +40°C		-5°C ... +40°C	
Store ambient temperature	-25°C ... +55°C		-25°C ... +55°C	
Degree of protection (IEC 60529)	IP 20		IP 20	
Terminal capacity	1-25mm <sup>2</sup>	AWG 18-8 solid&stranded Cu only	1,5-35mm <sup>2</sup>	AWG 16-6 solid&stranded Cu only
Screw	PZ M5	PZ M5	PZ M5	PZ M5
Torque	2Nm	2Nm 17,7 lb-in	2,5-3Nm	2Nm 17,7 lb-in
Mounting on EN 60715 rail	35mm rail			
Sealing possibility	ON and OFF			
Standards - fuse links	IEC/EN 60269-2 IEC/EN 60269-6 UL 284-4	IEC/EN 60269-2 IEC/EN 60269-6 UL 284-4	IEC/EN 60269-2 IEC/EN 60269-6 UL 284-4	UL 248-4 IEC/EN 60269-2
Standards - fuse holders	IEC 60947-1 IEC 60947-3	UL 4248-1 UL 4248-18 UL 486E CSA C22.2 No.65	IEC 60947-1 IEC 60947-3	UL 4248-1 UL 4248-18 UL 486E CSA C22.2 No.65
Test reports	Int		UL	
Certificates	UL Listed		UL Listed	

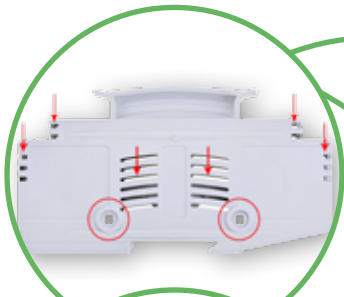
# NEW EFH 10/14x85 PV fuseholder

## Advantages of photovoltaic fuseholder EFH 10/14x85

→ Compliance with IEC 60947-1, IEC 60947-3, UL 4248-1, UL 4248-19, IEC 60269-1, IEC 60269-6



→ Flexible fuse carrier for easy replacement of the fuse link



→ For better cooling, the housing has special ventilation slots. And also there are special tabs on the sides of the case, which provide the necessary distance for better ventilation of devices.

→ All contact surfaces are silver plated



→ Contact material Cu – lower temperature rise, lower power dissipation



→ Mounting on standard DIN 35 mm rail

→ Plastic parts are made of firestop material (GW 960 °C)



→ For sizes of 10x85 and 10/14x85 in one type of photovoltaic fuseholder

→ Compact housing design without additional covers



→ Complete protection against touch according to IP 20

→ Changing of a fuse link without danger of direct touch of parts under voltage



→ More space for finger to open fuse carrier



# EFH 10/14x85 DC - Photovoltaic fuseholder

**NEW!**

Photovoltaic fuseholder EFH 10/14x85 d.c. is a protection device with exchangeable cylindrical gPV fuse links in sizes 10x85mm and 10/14x85mm.

EFH 10/14x85 d.c. with inserted fuse-link supports operating voltage of 1.500V d.c. and provides overload and short-circuit protection of electrical components in photovoltaic installations.

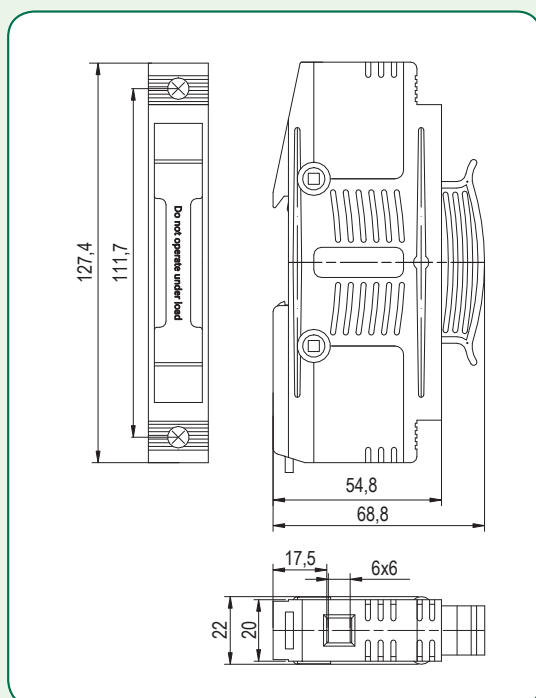
Product design offers complete protection against touch and has the possibility of connection supply from upper or from the lower side. EFH 10/14x85 d.c. has to be installed in an electrical enclosure with DIN type rail.

## General characteristics

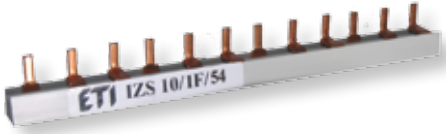
Rated operational current Ie	32A
Rated operational voltage Ue	1500 V d.c.
Rated insulating voltage Ui	1500 V d.c.
Max. power dissipation	6,5 W
Rated impulse withstand voltage Uimp	8kV
Conditional short-circuit current	30kA
Fuse type	10x85mm, 14x85mm
Pollution degree	3
Operating temperature	-5°C ... +40°C
Flammability rating (material):	GW 960°C (firestop plastic)
Mounting	TH 35
Wire	CU 75°C
Wire range	0,75 – 25 mm <sup>2</sup>
Screw terminals	PZ2
Torque rating	2,5 Nm
Standards - Fuse holder	IEC/EN 60947-1; IEC/EN 60947-3; IEC 60269-1; IEC 60269-6 UL 4248-1; UL 4248-19

## EFH 10/14x85

Type	Code No.	Number of poles	I <sub>max</sub> [A]	U <sub>e</sub> /U <sub>i</sub> [V d.c.]	Indicator	Weight [kg]	Packaging [pcs]
EFH 10/14x85	001703005	1P	32	1500	×	0,1	1/6/144



# Section rail



## EFH 10 DC

Type	Description	Code No.	Cross section (mm <sup>2</sup> )	Length (m)	Weight [g]	Packaging [pcs]
IZS10/1F/54	10 mm <sup>2</sup> , 1 pole, 54 mod	002921101	10	1	150	40
IZS16/1F/54	16mm <sup>2</sup> , 1 pole, 54 mod	002921111	16	1	220	40

For use with EFH10 DC

## EFH 14 DC

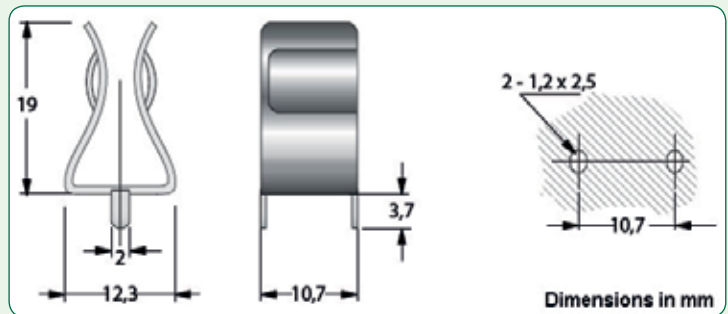
Type	Description	Code No.	Cross section (mm <sup>2</sup> )	Length (m)	Weight [g]	Packaging [pcs]
IZS16/1F/36	16mm <sup>2</sup> , 1 pole, 36 mod	002921121	16	1	280	40

For use with EFH14 DC

# Fuseholder for CH fuse links

## Fuseholders for CH10 fuse links

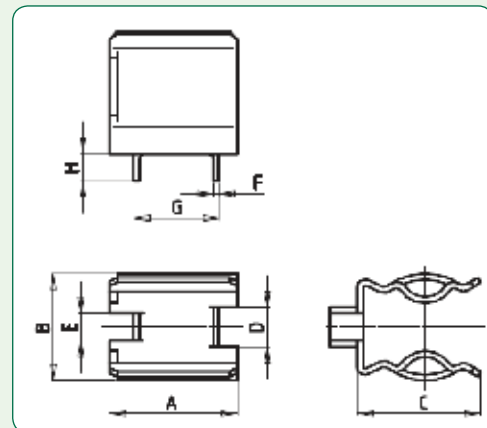
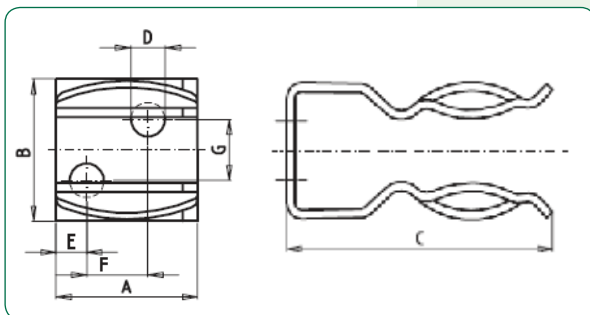
Code	Type	Weight(g)	Packaging [pcs]
006710335	HK10383	1	250



Type	Dimensions [mm]							
	A	B	C	D	E	F	G	H
HK10383	12,3	9,8	19,0	2,0	2,0	0,75	11,0	4,0

## Fuseholders for CH14 fuse links

Code	Type	Weight(g)	Packaging [pcs]
006710340	CH14-PCB	5	100
006710341	CH14-SCR	5	100



Type	Dimensions [mm]						
	A	B	C	D	E	F	G
CH14-SCR	16	16	23	4,2	6,5	0	0

Type	Dimensions [mm]							
	A	B	C	D	E	F	G	H
CH14-PCB	16	14	15,5	5	3,5	0,75	10,7	3,5

# NH DC 750V - Fuse-links

## General characteristics

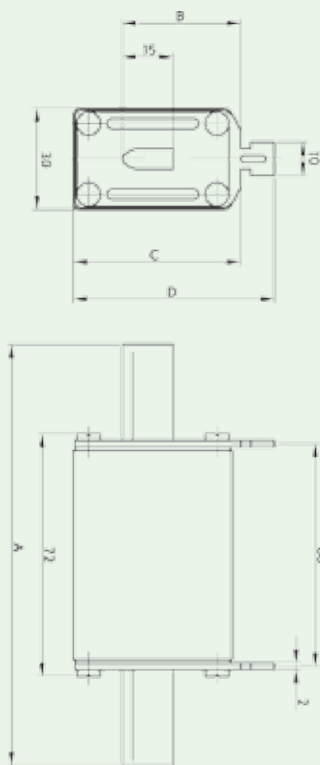
Rated voltage	750V d.c. (L/R = 15ms)
Breaking capacity	20 kA d.c.
Standards	IEC 60269-6 ed 1.0 (2010-9), IEC 60269-4
Application	Fuse-link for DC application. Applied in fuse base PK0 and PK1 DC.



## DC 750 V

In [A]	gPV		Power dissipation [W]	Pre-arcing Joule integral [I <sup>2</sup> t] (L/R = 15ms)	Operating Joule integral [I <sup>2</sup> t] (L/R = 15ms)	Weight [g]	Packaging [pcs]
	Code No. Size 0	Code No. Size 1C					
32	004110308	004110300	7,6	70	370	280/0 300/1C	3/24
40	004110310	004110301	8,8	135	650		
50	004110311	004110302	11,0	250	1.000		
63	004110312	004110303	13,5	520	1.790		
80	004110313	004110304	17,0	1.050	3.000		
100	004110314	004110305	21,0	2.580	6.140		
125	004110315	004110306	22	6.300	14.090		
160	004110316	004110307	32	13.060	27.220		

Size	A	B	C	D
0	125	35	50	60
1C	135	40	55	65



gPV, PV(gR) 750V, 1000V dimensions



# NH DC 1000V - Fuse-links

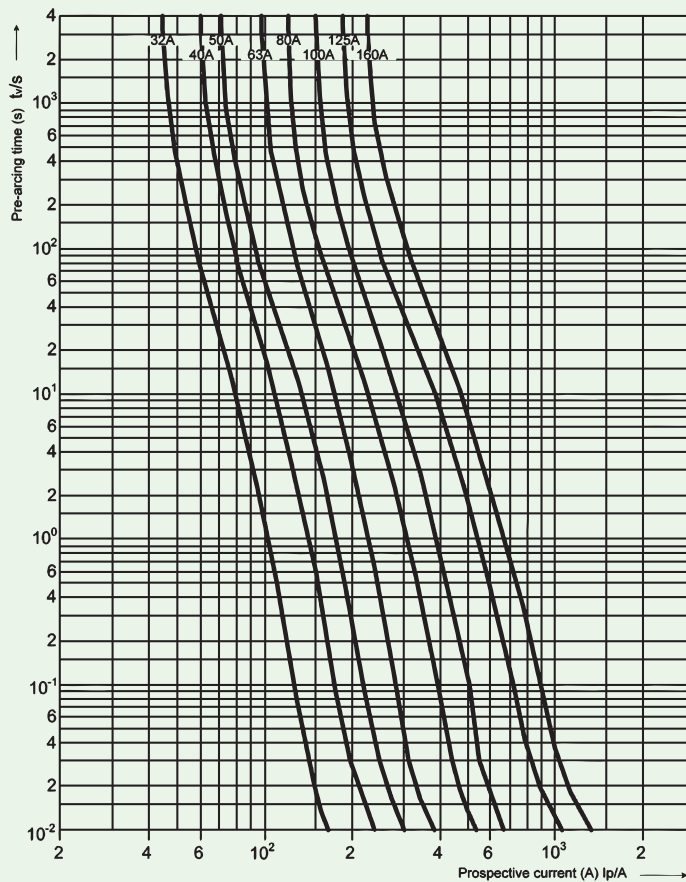


### General characteristics

Rated voltage	1000V d.c. (L/R = 2ms)
Breaking capacity	20 kA d.c.
Standards Fuse-links	IEC 60269-6 ed 1.0 (2010-9), IEC 60269-4
Application	Fuse-link for DC application. Applied in fuse base PK0 and PK1 DC.

### DC 1000 V

I <sub>n</sub> [A]	gPV		Power dissipation [W]	Pre-arcing Joule integral [I <sup>2</sup> t] (L/R = 2ms)	Operating Joule integral [I <sup>2</sup> t] (L/R = 2ms)	Weight [g]	Packaging [pcs]
	Code No. Size 0	Code No. Size 1C					
32	004110381	004110371	7,6	52	430	280/0 300/1C	3/24
40	004110383	004110373	8,8	96	730		
50	004110384	004110374	11,0	155	920		
63	004110385	004110375	13,5	290	1.760		
80	004110386	004110376	17,0	520	3.160		
100	004110387	004110377	21,0	1.110	5.280		
125	004110388	004110378	22	2.800	11.340		
160	004110389	004110379	32	5.950	20.750		



gPV, PV(gR) 750V, 1000V t-I characteristics

# NH DC 1000V - Fuse-links

## General characteristics

Rated voltage	1000V d.c. (L/R=1ms)
Breaking capacity	30kA d.c.
Standards	IEC 60269-6 ed. 1.0
Application	Fuse link for DC application. Applied in fuse base PK1, 2, 3 1000V d.c..

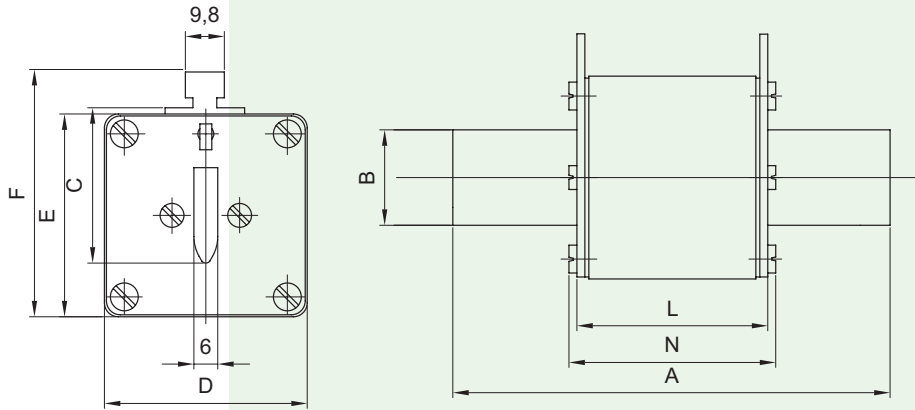


## DC 1000V gPV

Size	$I_n$ [A]	gPV Standard indicator Code No. Pic.1	gPV $S_{110}$ screw contact Code No. Pic.2	gPV $U_{110}$ screw contact Code No. Pic.3	gPV G screw contact with centre trip indicator for microswitch MK Code No. Pic.4	Power dissipation ( $0,7 \times I_n$ ) [W]	Power dissipation [W]	Pre-arcing Joule integral [I <sup>2</sup> t] (L/R = 1ms)	Operating Joule integral [I <sup>2</sup> t] (L/R = 1ms)	Weight [g]	Packaging [pcs]
1	200	004110342				11	27	4.400	29.000	500	3/24
2	200	004110343	004110292	004110296	004110346	11	26	4.400	29.000	650	1/16 (G screw contact: 2/32)
	250	004110344	004110293	004110297	004110347	15	36	6.000	38.000		
3	160	004110456				15	38	5.000	10.000	1200	3/15 (G screw contact: 2/9)
	200	004110455				18	45	10.000	20.000		
	250	004110458				18	44	20.000	40.000		
	315	004110460	004110294	004110298	004110232	24	54	40.000	80.000		
	350	004110459	004110348	004110349	004110233	25	55	45.000	90.000		
	400	004110457	004110295	004110299	004110234	24	58	46.000	138.000		



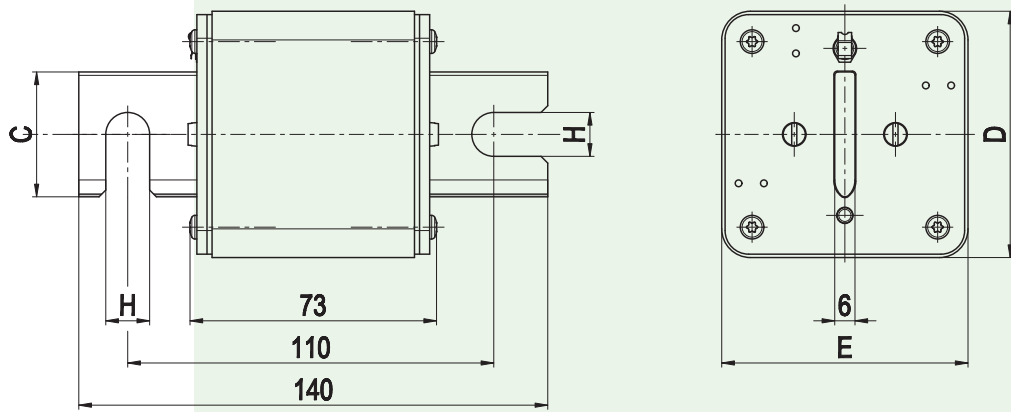
Pic.1



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

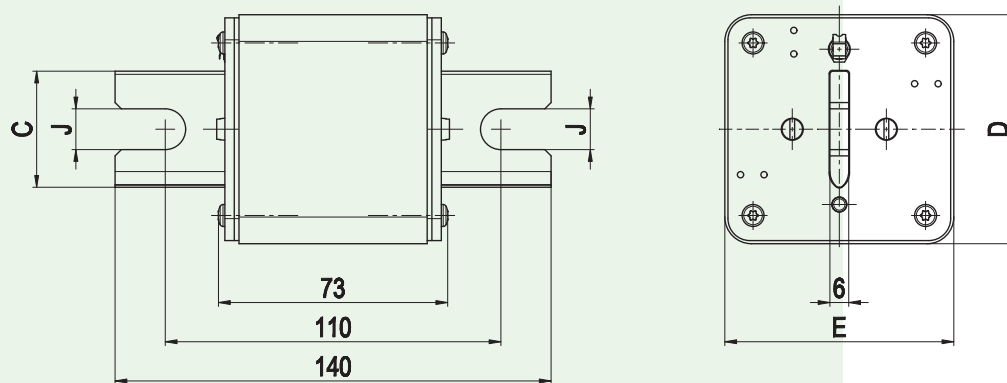
Pic.2



S<sub>110</sub> screw contact

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

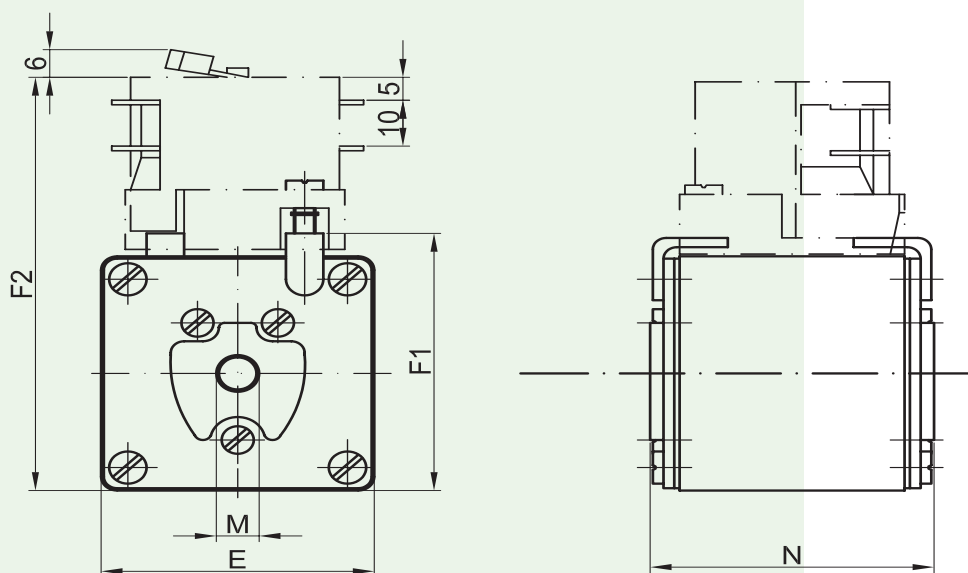
Pic.3



**U<sub>110</sub> screw contact**

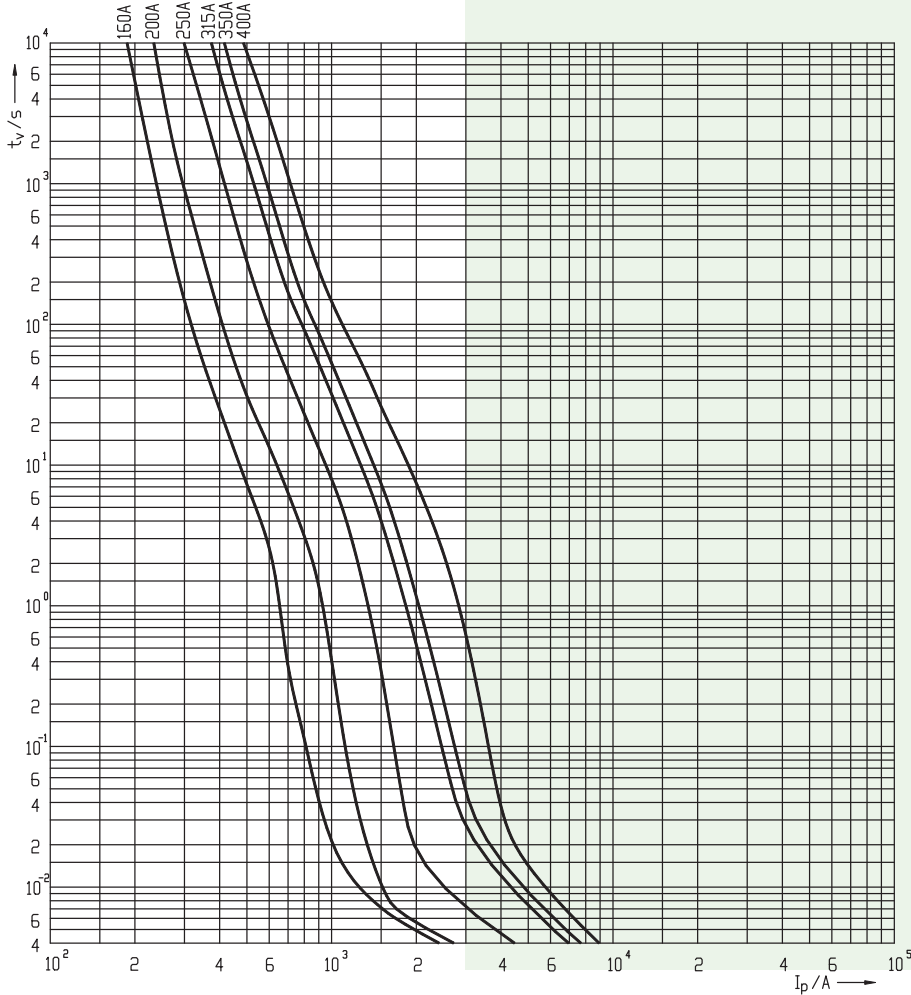
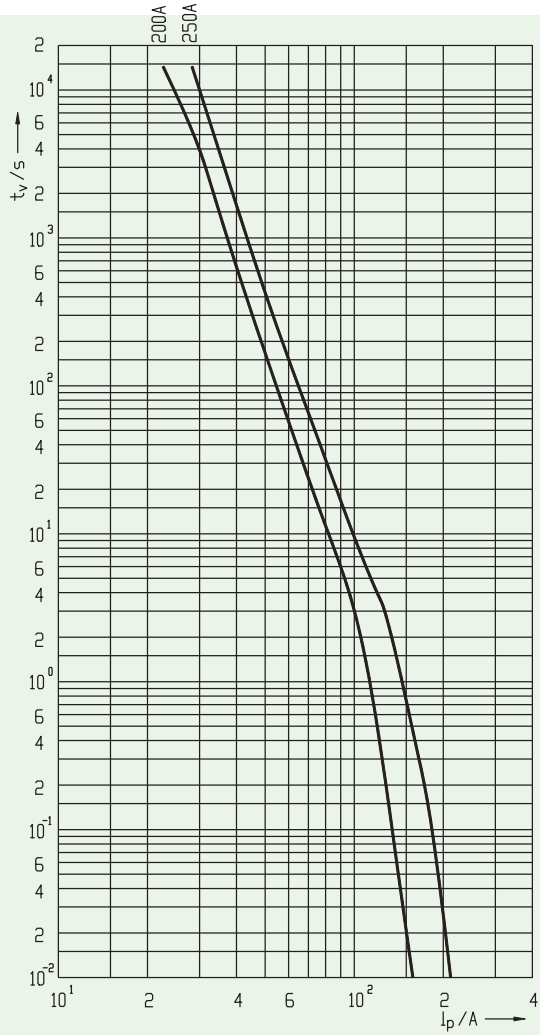
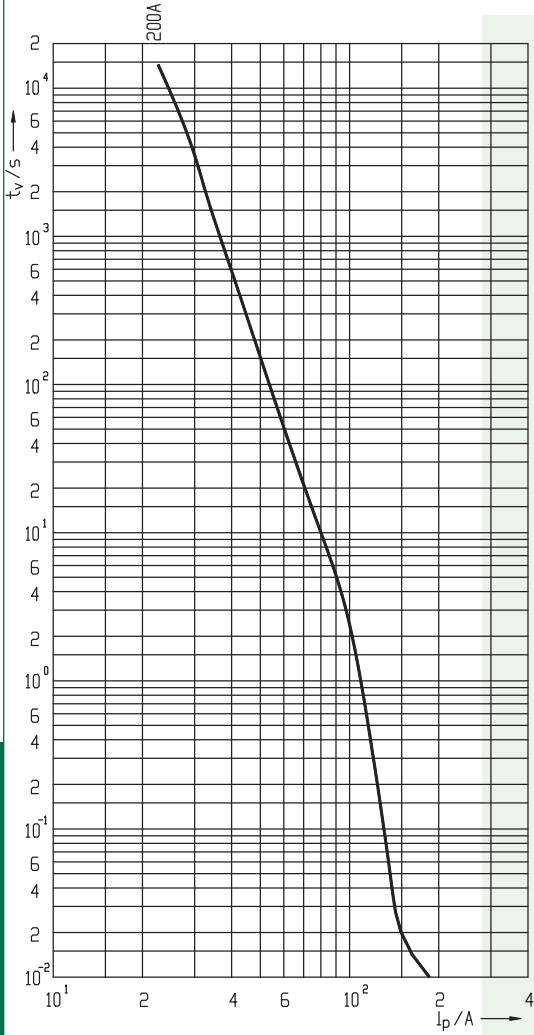
Size	C	J	E	D
2	30	13	60	60
3	37	13	73	73

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



NH3 gPV 1000V t-I characteristics



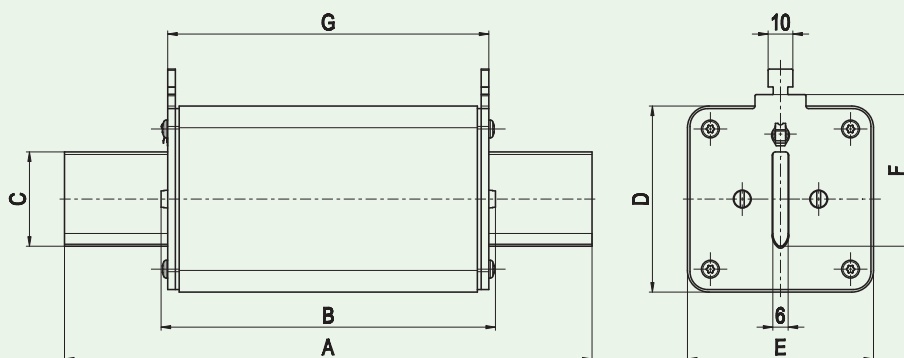
# NH DC 1000V - Fuse-links

## General characteristics

Rated voltage	1000V d.c. (L/R=2ms)
Breaking capacity	30kA d.c.
Standards	IEC 60269-6
Application	Fuse link for DC application. Applied in fuse base PK XL

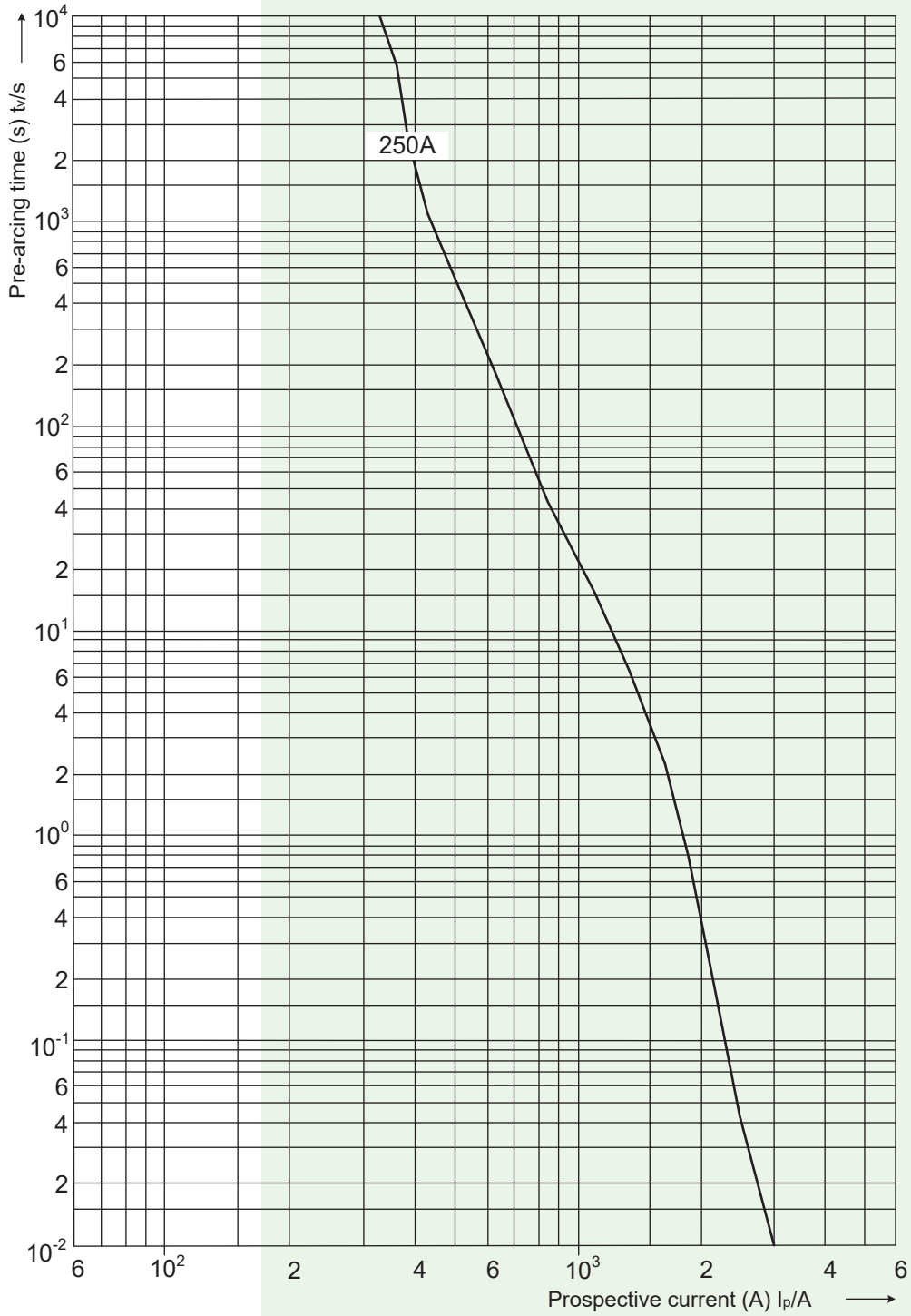
## DC 1000V gPV

Size	$I_n$ [A]	gPV Standard indicator	Power dissipation $(0,7 \times I_n^2)$ [W]	Power dissipation [W]	Pre-arcing Joule integral $[I^2t]$ (L/R = 2ms)	Operating Joule integral $[I^2t]$ (L/R = 2ms)	Weight [g]	Packaging [pcs]
1XL	250	004110646	24	42	19.000	180.000	950	1/15



Size	Dimensions [mm]						
	A	B	C	D	E	F	G
1XL	192	131	24	51	51	41	125





NH 1XL gPV 1000V t-I characteristics

# NH DC 1100V - Fuse-links

## General characteristics

Rated voltage	1100V d.c. (L/R = 5ms)
Breaking capacity	10 kA d.c.
Standards	IEC 60269-6 ed 1.0 (2010-9), IEC 60269-4
Application	Fuse-link for DC application. Applied in fuse base PK XL 1500V.



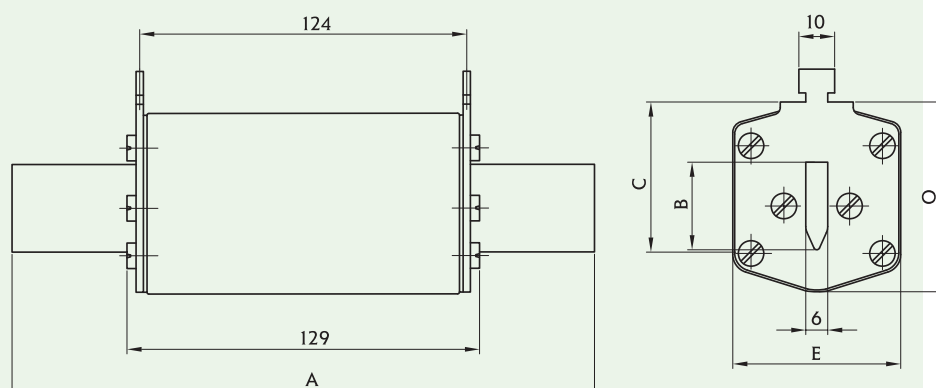
## DC 1100V

Size	$I_n$ [A]	Standard indicator (pic.1)	Trip indicator - K (pic.2)	$S_{170}$ screw contact (pic.3)	Power dissipation (0,7xI <sub>n</sub> ) P <sub>d</sub> [W]	Power dissipation [W]	Pre-arcing Joule integral [I <sup>2</sup> t] (L/R = 5ms)	Operating Joule integral [I <sup>2</sup> t] (L/R = 5ms)	Weight [g]	Packaging [pcs]
1XL	63	004110426	004110431	004110435	6,2	15,0	2.720	3.520	750	1/17
	80	004110427	004110432	004110436	7	17,0	4.000	5.500		
	100	004110428	004110433	004110437	8,2	20,0	6.500	9.000		
	125	004110429	004110434	004110438	9,6	23,0	11.000	15.000		
	160	004110410	004110414	004110420	14,6	35,0	19.400	28.640		
	200	004110411	004110416	004110439	13,9	32,6	42.600	83.400		
2XL	200	004110430	004110415	004110421	17,8	42,0	40.000	60.000	1050	1/15
	250	004110413	004110417	004110423	17,9	46,0	85.260	117.400		
	315	004110418	/	/	22	53	35.000	115.000		
	350*	004110483	/	/	27	65,5	40.000	130.000		
3L	200	004110451	/	/	17	41	40.000	59.000	1360	1/10
	224	004110452	/	/	17,5	44	60.000	88.000		
	250	004110453	/	/	17,7	45	85.000	115.000		
	300	004110454	/	/	25	53,5	166.000	220.000		
	315	004110425	004110419	004110424	25,2	54,0	166.800	221.900		
	350	004110440	004110442	004110444	28,2	60,5	175.000	260.000		
	400	004110441	004110443	004110445	28,8	67,0	235.000	345.000		
	450*	004110448	/	004110450	40	98	110.000	280.000		
	500*	004110446	/	004110447	42	112	150.000	370.000		
	630*	004110449	/	004110484	46	119	180.000	450.000		

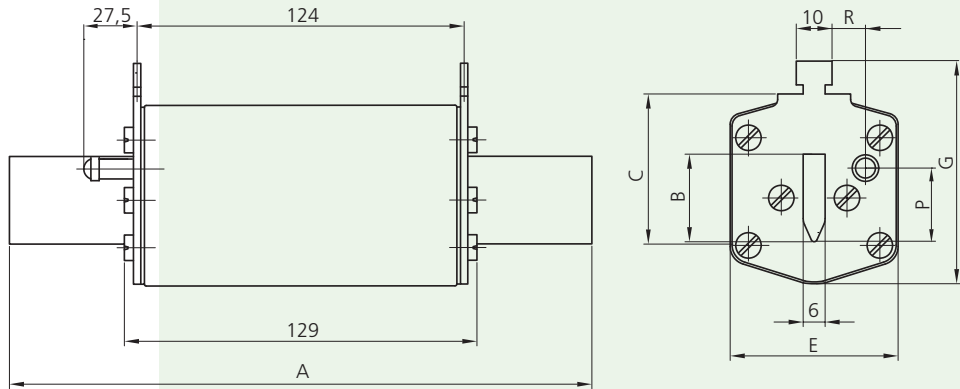
\*L/R=2ms, 30kA d.c.; special dimensions (see next page)

Green protect - DC

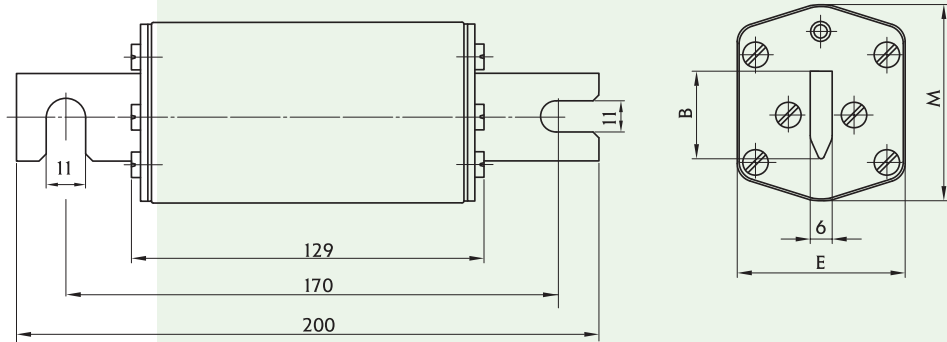
Picture 1



Picture 2

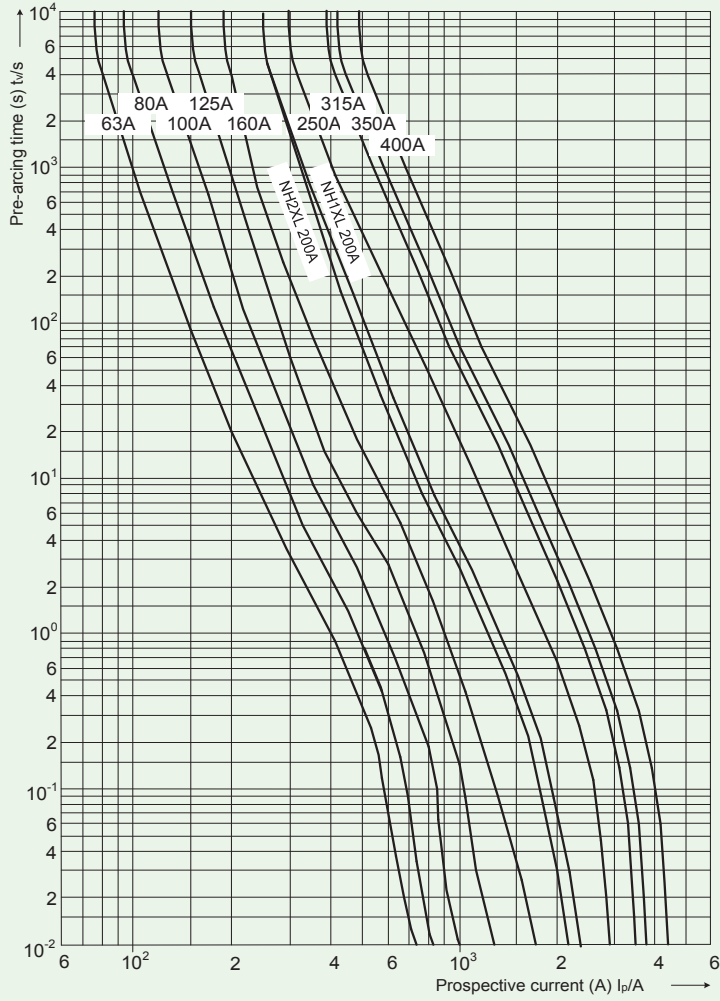


Picture 3

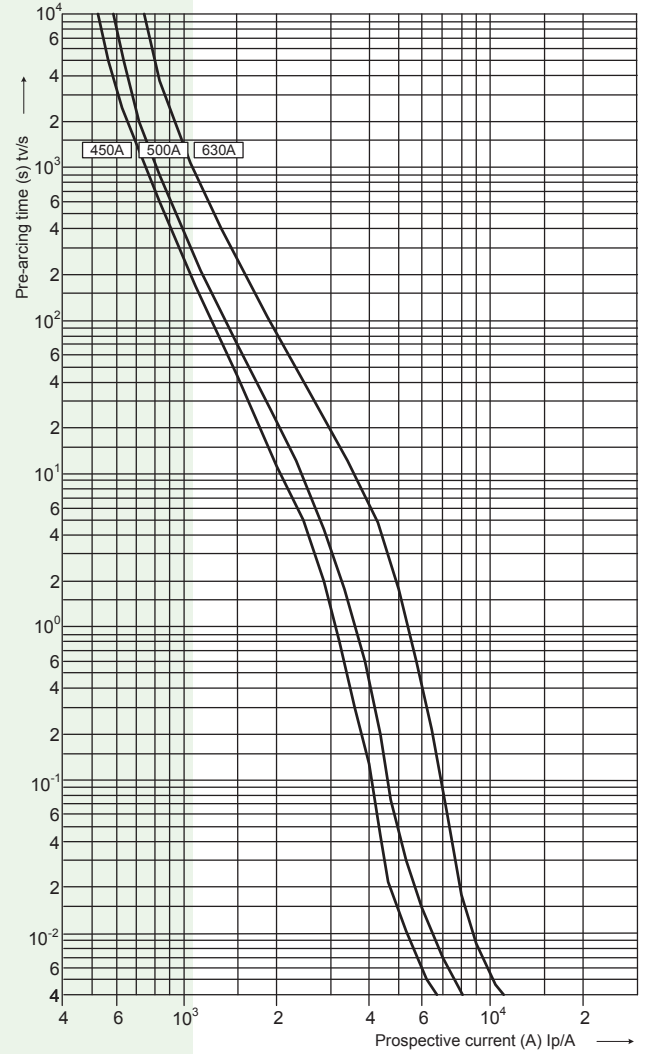


Size	Dimensions [mm]								
	A	B	C	E	G	P	R	M	O
1XL	194	24	40	46	61,5	20,5	13,7	50	52
2XL	209	30	48	54	71	27,3	16,2	59	61
*2XL (350A)	208	30	48	60	/	/	/	60	/
3L	209	37	60	64	82	35,6	17,0	70	74
*3L (450A, 500A, 630A)	209	37	60	73	/	/	/	73	77

**gPV, PV(gR) 1100V t-I characteristics**

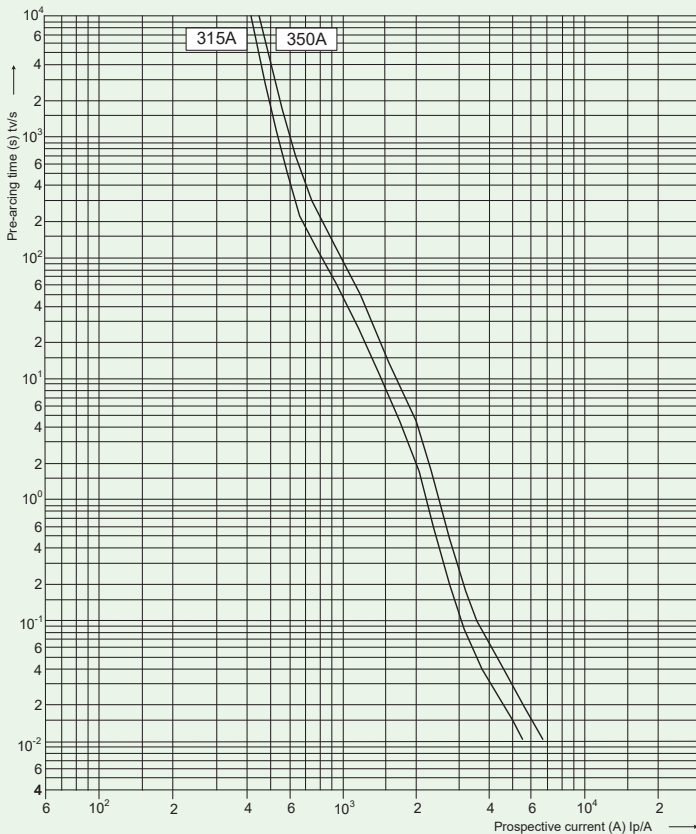


**gPV, PV(gR) 1100V t-I characteristics**



**NH2XL 315,350A DC 1100V gPV**

Time-current characteristic



# NH DC 1100V - Fuse-links



General characteristics		UL file: E347771
Rated voltage	1100V d.c. (L/R = 2ms)	
Breaking capacity	10 kA d.c.	
Standards	UL 2579, UL 248-1	
Application	Fuse link for DC application. Applied in fuse base PK XL 1500V.	

## DC 1100V gPV

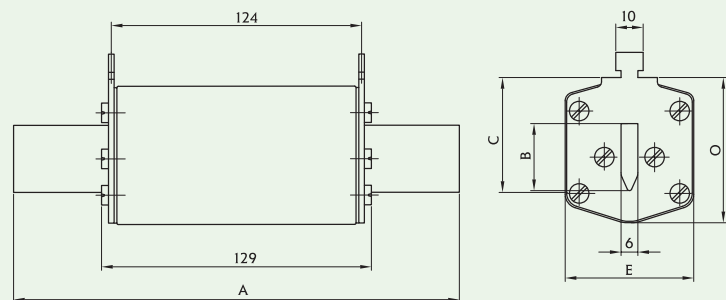
Size	$I_n$ [A]	Standard indicator (pic.1)	$S_{170}$ screw contact (pic.2)	$U_{170}$ screw contact (pic.3)	Power dissipation (0,7xI <sub>n</sub> ) P <sub>d</sub> [W]	Power dissipation [W]	Pre-arcing Joule integral [I <sup>2</sup> t] (L/R = 2ms)	Operating Joule integral [I <sup>2</sup> t] (L/R = 2ms)	Weight [g]	Packaging [pcs]
1XL	63	004110391	004110472	004110487	7	15,7	2.800	3.500	750	1/17
	80	004110392	004110473	004110488	7	16	4.500	5.500		
	100	004110393	004110474	004110489	8,3	19	7.500	9.000		
	125	004110394	004110475	004110490	9,7	22	13.000	15.000		
	160	004110395	004110476	004110491	13,2	30	25.000	30.000		
2XL	200	004110396	004110477	004110492	15	34,8	39.000	80.000	1050	1/15
	250	004110397	004110478	004110493	15,9	36	55.000	75.000		
3L	315	004110399	004110480	004110495	23	53,6	170.000	230.000	1360	1/10
	350	004110400	004110481	004110496	26	58	195.000	260.000		
	400	004110401	004110482	004110497	28	64,8	250.000	350.000		
	450	004110485	004110486	004110498	34	85	130.000	250.000		
	500*	004110629	004110628	004110627	37	98	150.000	370.000		

\*size 73x73; dimensions on page 36 (3L).

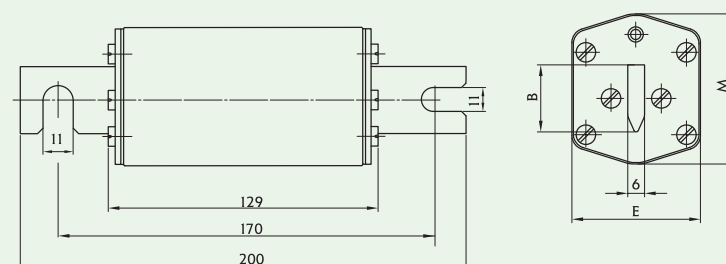
Size	Dimensions [mm]								
	A	B	C	E	G	P	R	M	O
1XL	194	24	40	46	61,5	20,5	13,7	50	52
2XL	209	30	48	54	71	27,3	16,2	59	61
3L	209	37	60	64	82	35,6	17,0	70	74



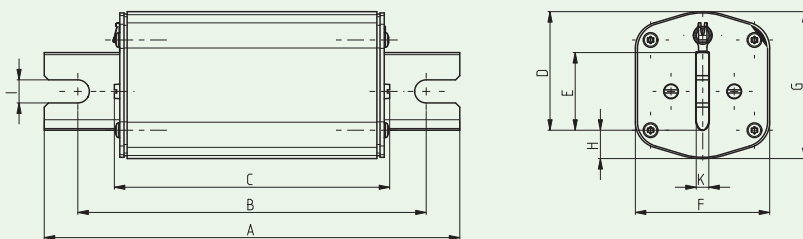
Picture 1



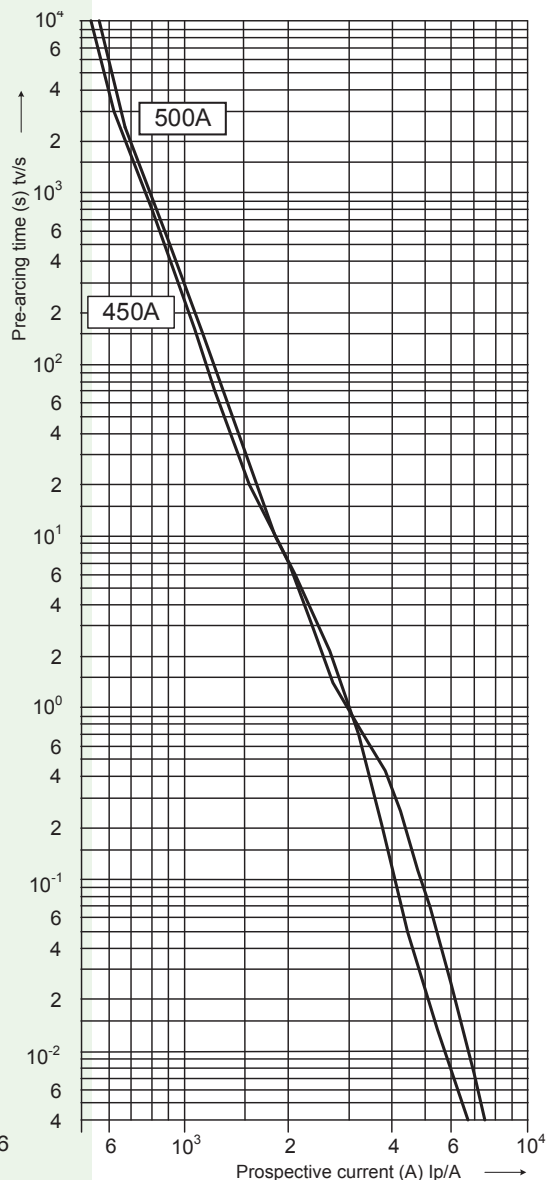
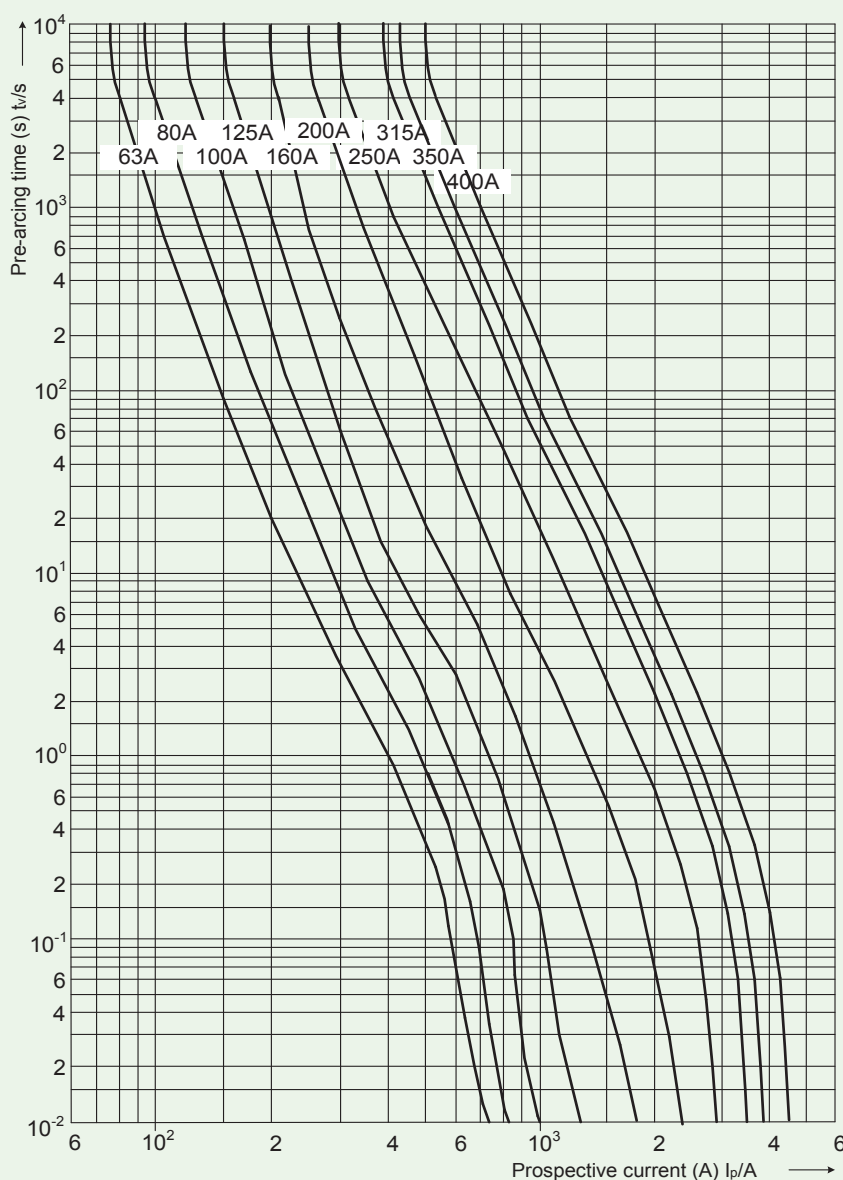
Picture 2



Picture 3



Size	Dimensions [mm]									
	A	B	C	D	E	F	G	H	K	I
1XL	197	170	133	40	24	46	50	16	6	11
2XL	200	170	130	48	30	54	59	18	6	13
3L	200	170	130	60	37	64	70	23	6	13



**gPV 1100V t-I characteristics**

# NH 01XL DC 1500V - Fuse-links

**NEW!**

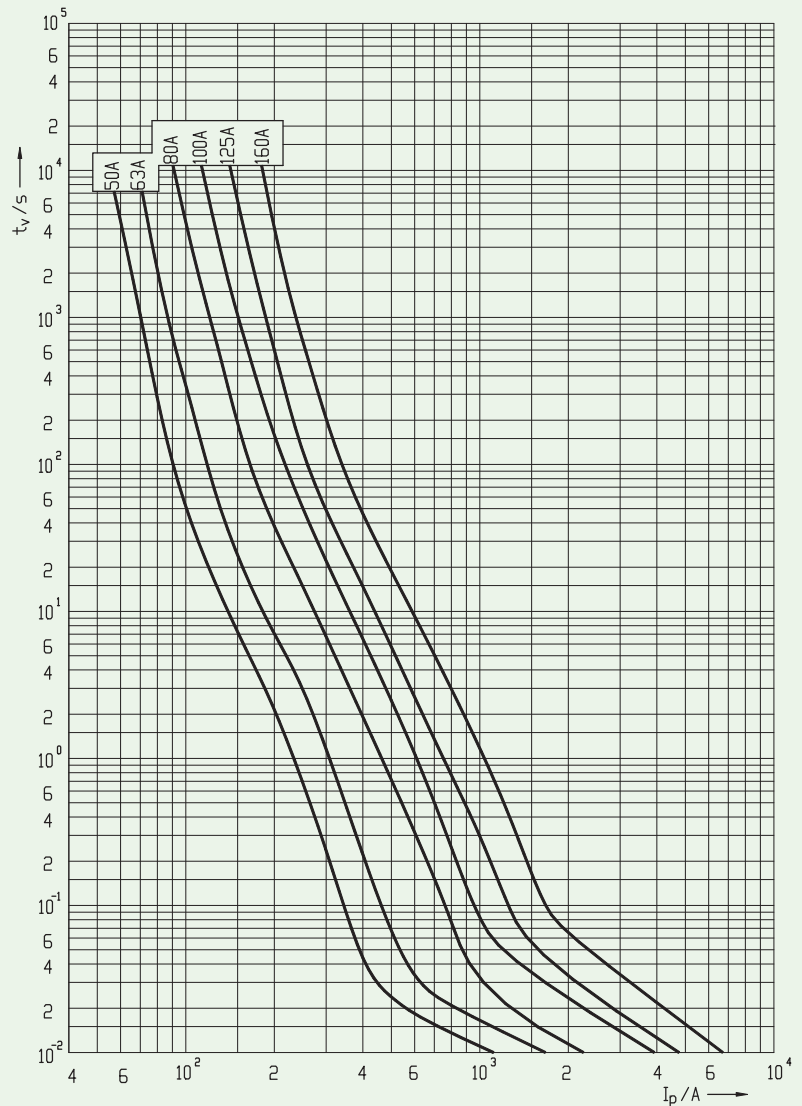
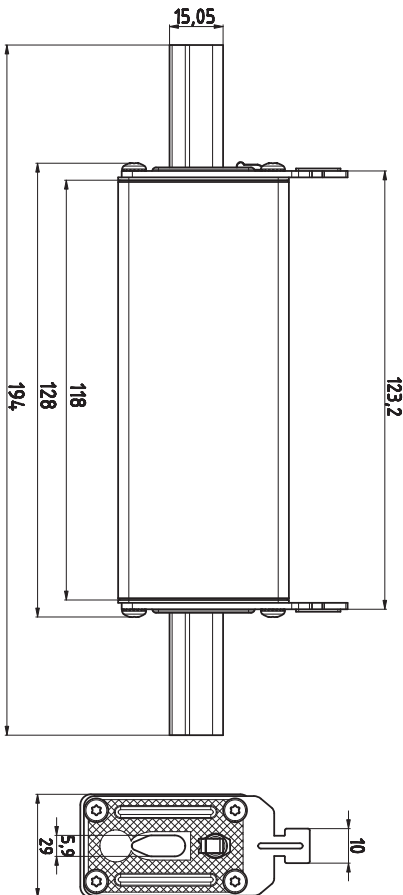


### General characteristics

Rated voltage	1500V d.c. (L/R=3ms)
Breaking capacity	30kA d.c.
Standards	IEC 60269-6, UL248-19
Application	Fuse link for DC application. Applied in fuse base PK1XL.

### DC 1500V gPV

Size	$I_n$ [A]	gPV Standard indicator	Power dissipation (0,7xI <sub>n</sub> ) P <sub>d</sub> [W]	Power dissipation [W]	Pre-arcing Joule integral [I <sup>2</sup> t] (L/R = 3ms)	Operating Joule integral [I <sup>2</sup> t] (L/R = 3ms)	Weight [g]	Packaging [pcs]
01XL	50	004110692	7	18	500	3.000	350	3/30
	63	004110693	8,5	22	1.000	6.000		
	80	004110694	9	21	2.000	15.000		
	100	004110695	11	29	3.500	25.000		
	125	004110696	13	36	4.000	30.000		
	160	004110697	17	46	6.000	48.000		



NH 1XL gPV 1500V t-I characteristics



# NH DC 1500V - Fuse links

**NEW!**



General characteristics		UL file E347771*
Rated voltage	1500V d.c. (L/R=3ms)	
Breaking capacity	30kA d.c.	
Standards	IEC 60269-6, UL 248-19	
Application	Fuse link for DC application. Applied in fuse base PK XL 1500V.	

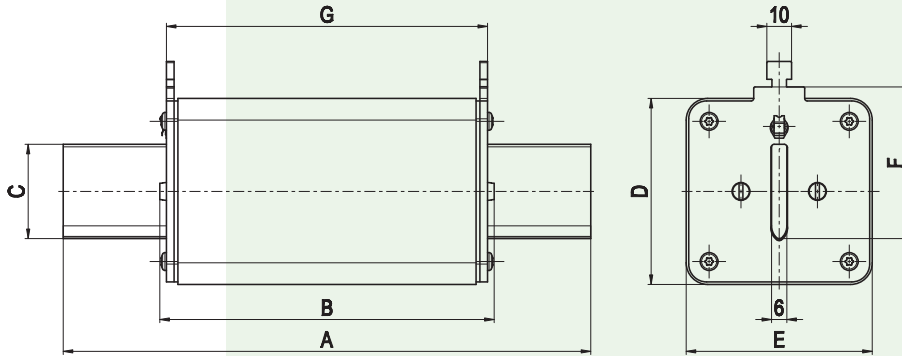
\* UL for 450A and 500A pending

DC 1500V										
Size	I <sub>n</sub> [A]	Standard indicator (pic.1)	gPV S <sub>170</sub> screw contact (pic.2)	U <sub>170</sub> screw contact (pic.3)	Power dissipation (0,7xI <sub>n</sub> ) P <sub>d</sub> [W]	Power dissipation [W]	Pre-arcing Joule integral [I²t] (L/R = 3ms)	Operating Joule integral [I²t] (L/R = 3ms)	Weight [g]	Packaging [pcs]
1XL	50	004110621	004110622	004110623	6	14	800	3500	950	1/15
	63	004110560	004110591	004110606	6,2	14	1.500	6.000		
	80	004110561	004110592	004110607	7	16	5.000	15.000		
	100	004110562	004110593	004110608	8,3	19	10.000	26.000		
	125	004110563	004110594	004110609	9,7	22	15.000	37.000		
	160	004110564	004110595	004110610	13,2	30	19.000	48.000		
2XL	200	004110565	004110596	004110611	13,7	32,5	22.000	75.000	1350	1/9
	200	004110566	004110597	004110612	15,9	36	42.000	75.000		
3L	250	004110567	004110598	004110613	19,3	44	73.000	132.000	1970	1/9
	315	004110630	004110635	004110640	22,2	57	65.000	300.000		
	350	004110631	004110636	004110641	23,7	61	75.000	350.000		
	400	004110632	004110637	004110642	26,8	67	85.000	450.000		
	450	004110633	004110638	004110643	29	75	130.000	600.000		
	500	004110634	004110639	004110644	44,3	79	160.000	700.000		

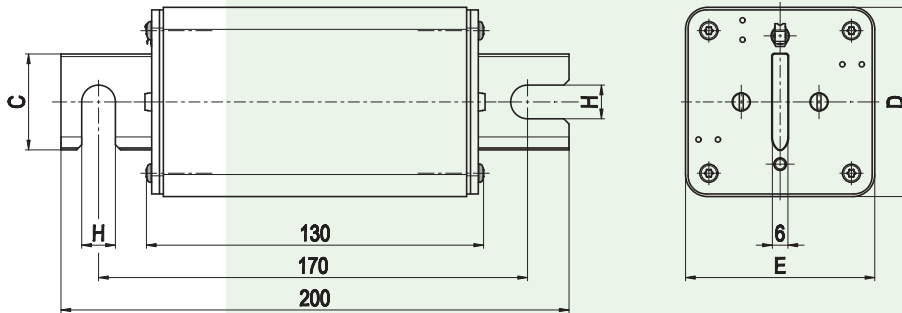


Green protect - DC

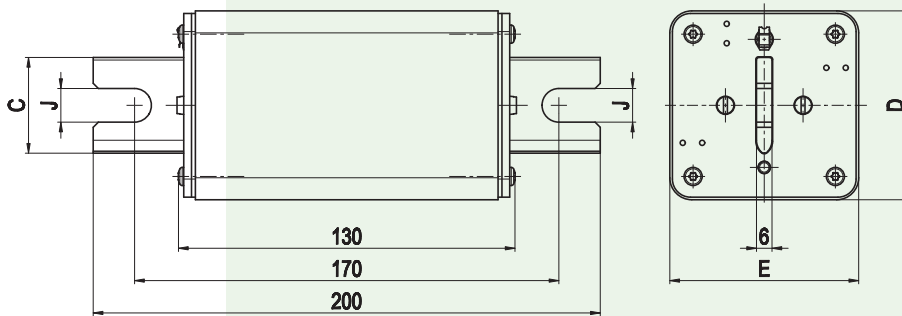
Picture 1



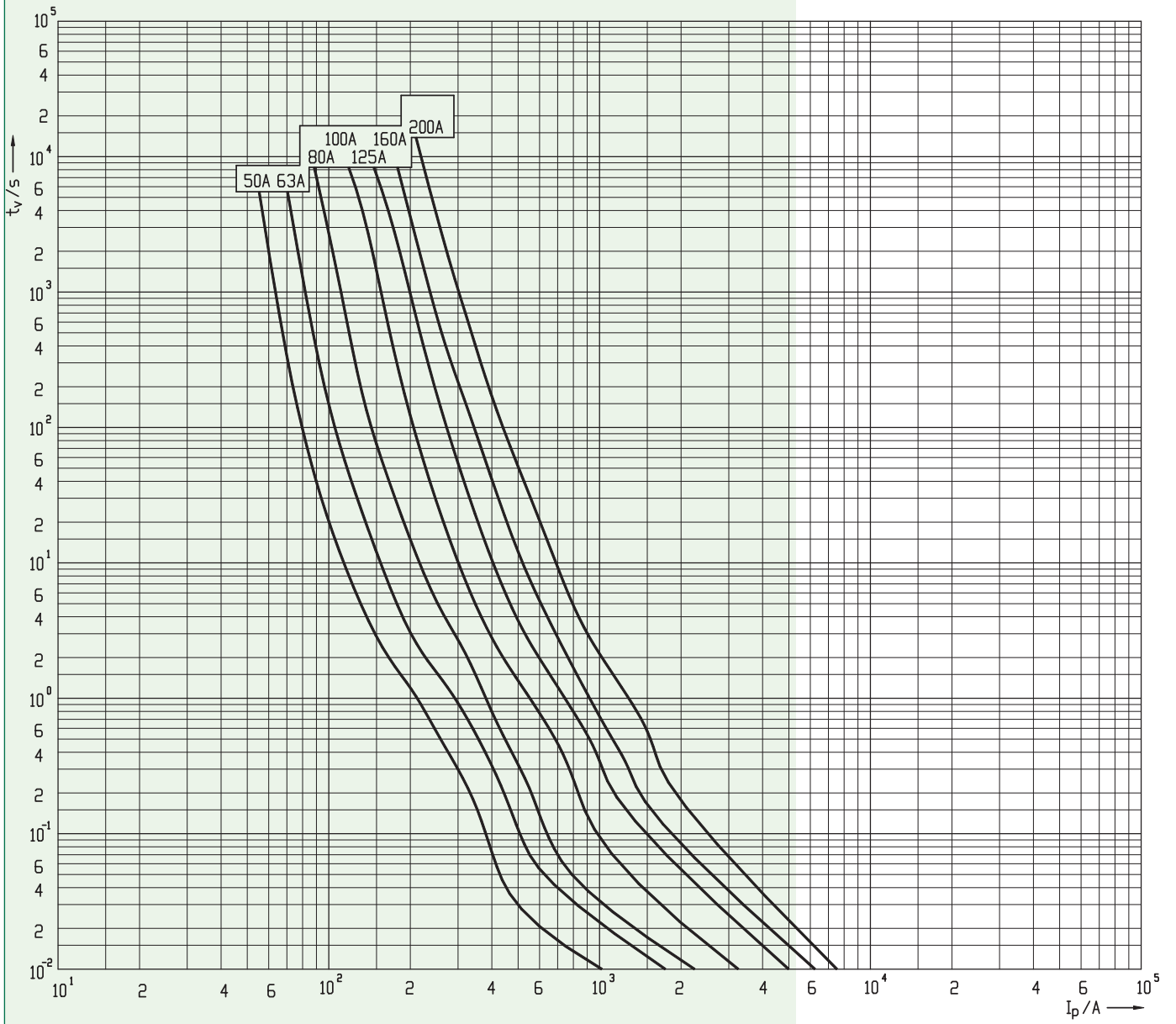
Picture 2



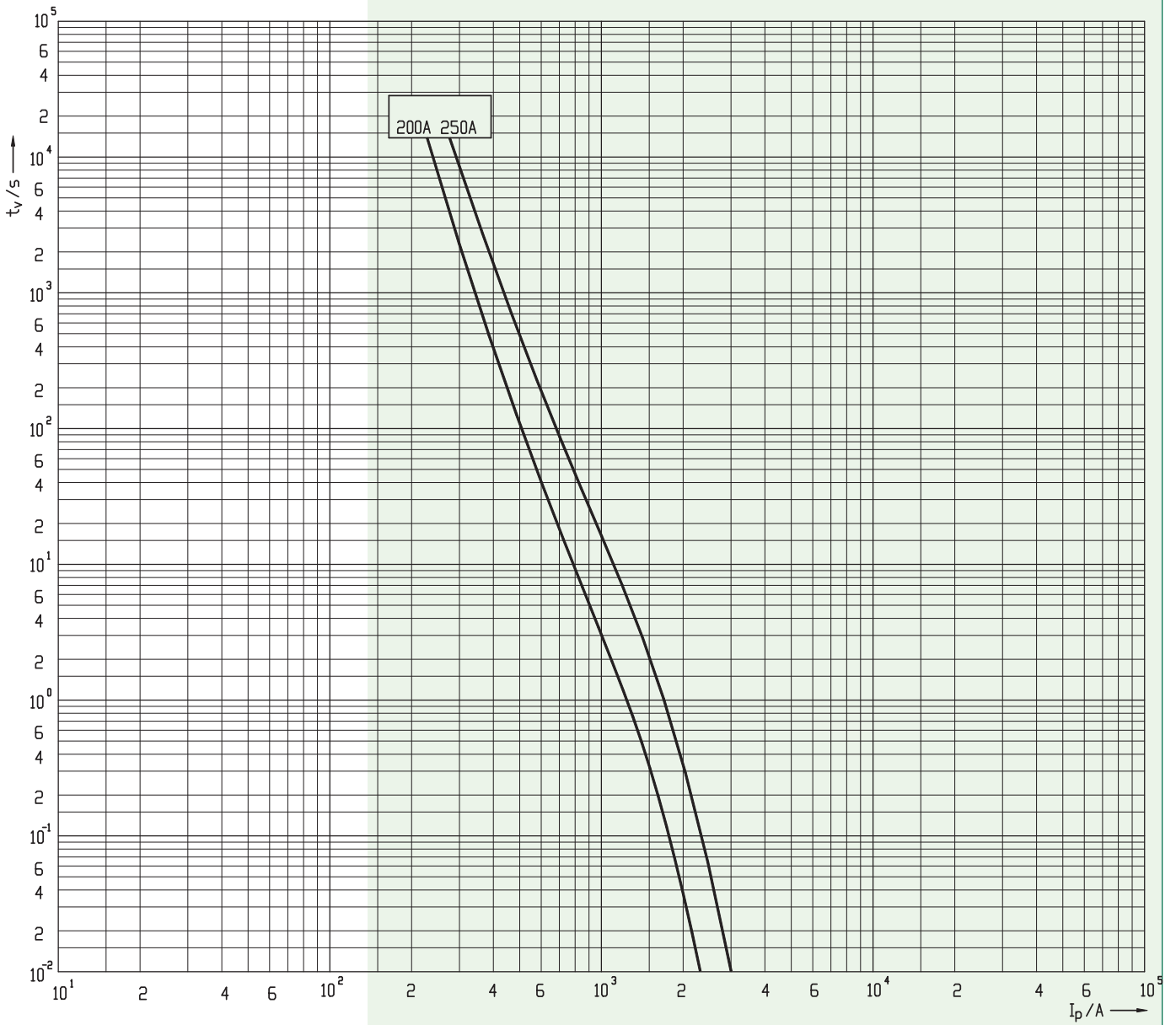
Picture 3



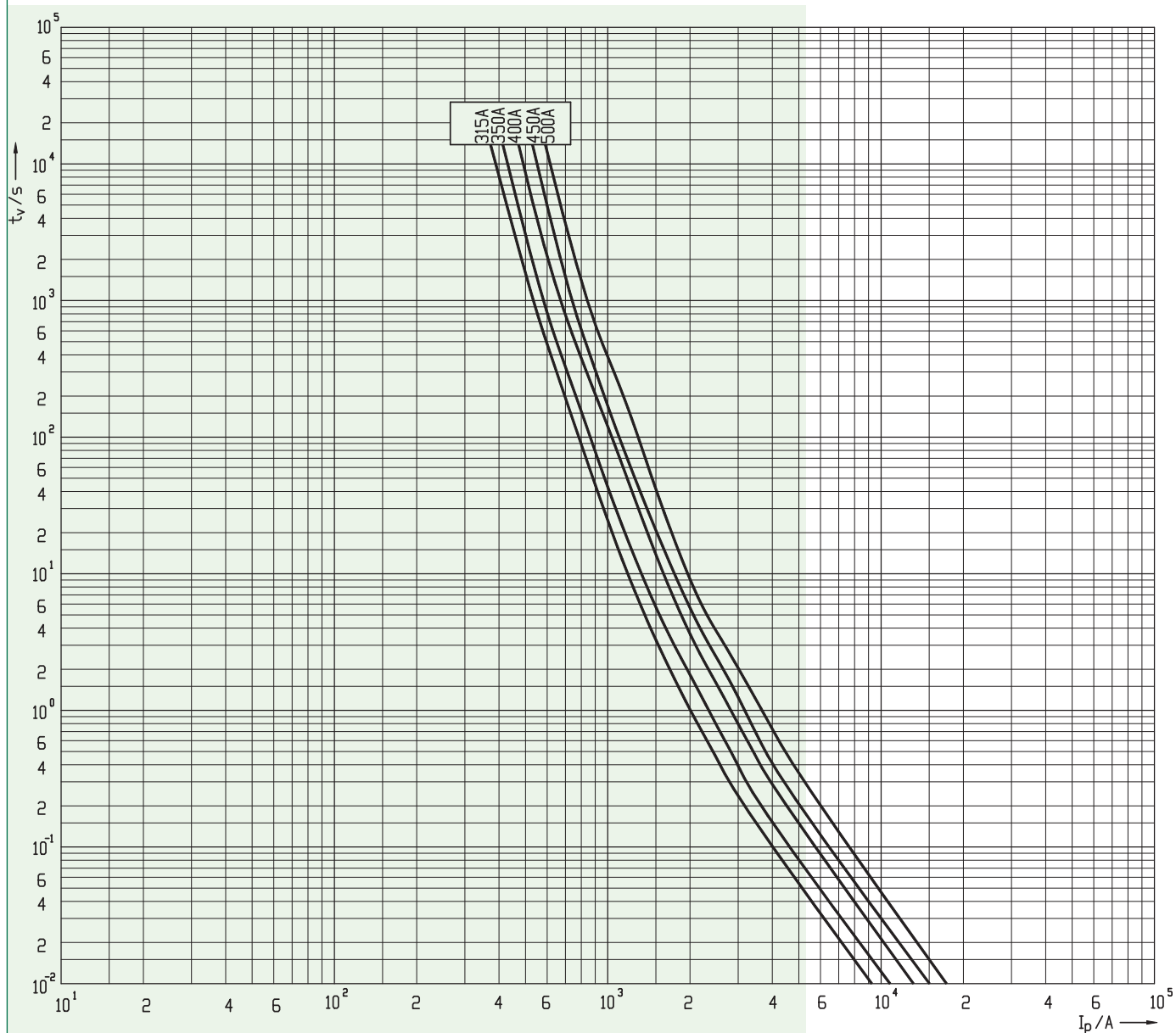
Size	Dimensions [mm]								
	A	B	C	D	E	F	G	H	J
1XL	192	131	24	51	51	43,5	125	11	11
2XL	208	130	30	60	60	48	126	11	13
3L	208	130	37	73	73	60	126	11	13



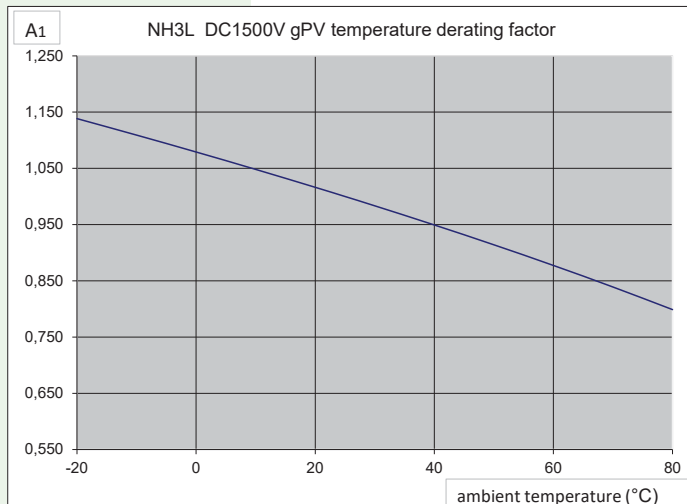
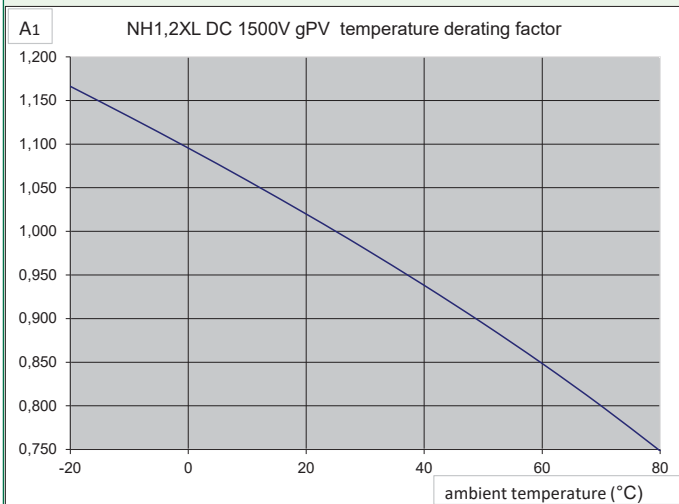
t-I characteristics NH 1XL



t-I characteristics NH 2XL



t-I characteristics NH 3L



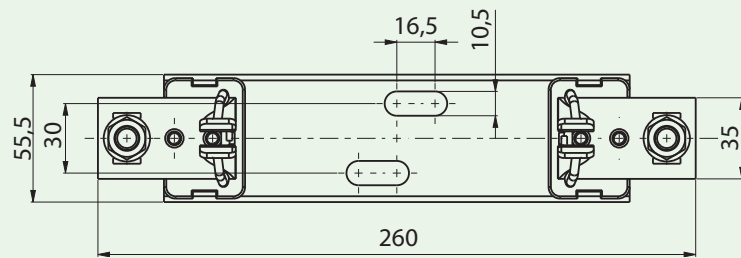
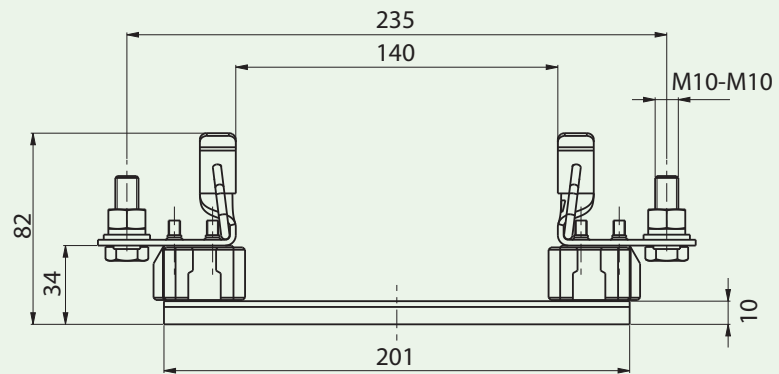
# Fuse base PK XL

## General characteristics

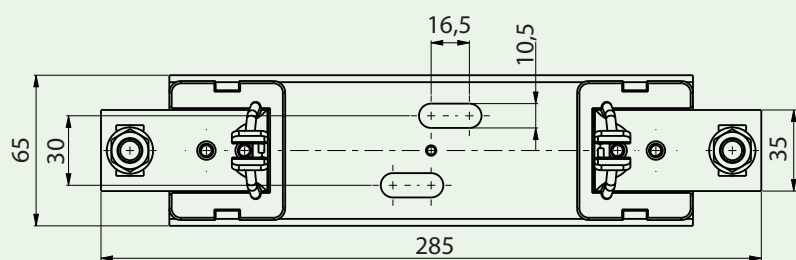
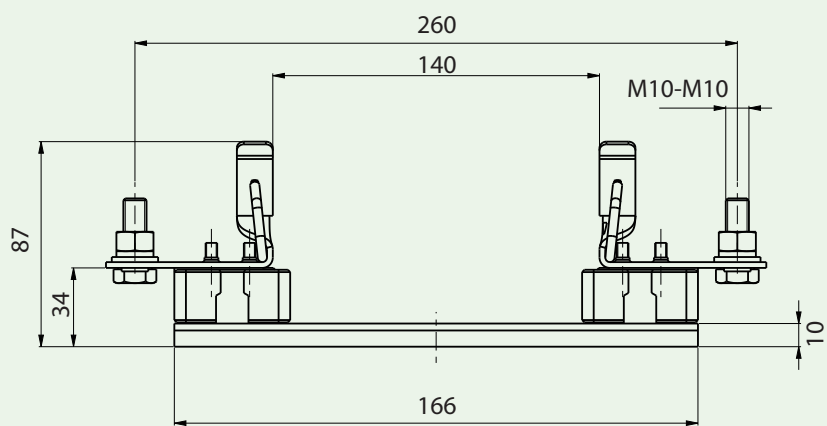
Rated voltage	1500V a.c./d.c.
Rated current	250A, 400A, 630A
Insulation class	C-VDE 0110
Rated torque-contact (size 1XL,2XL,3L)	32Nm
Rated torque (mounting plate)	12Nm
Degree of protection	IP00
Standards	EN 60269, IEC60269, DIN VDE 0636, DIN 43620, DIN 43623

## Fuse base PK XL

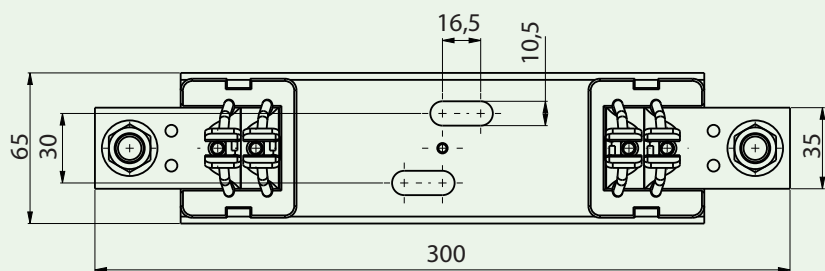
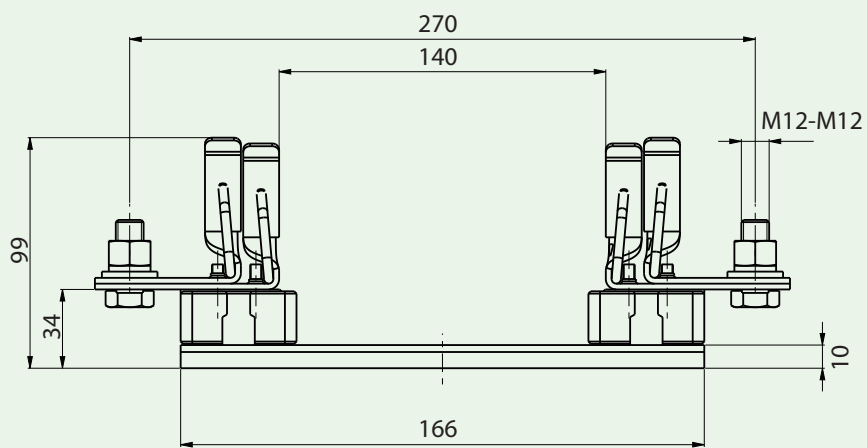
Type	$I_n$ [A]	Cable lugs according to DIN 46235 [mm <sup>2</sup> ]	Code No.	Weight [g]	Packaging [pcs]
PK1XL M10-M10 1500V 1p	250	25-150	004132017	675	3
PK2XL M10-M10 1500V 1p	400	25-240	004132019	921	1
PK3L M12-M12 1500V 1p	630	25-300	004132023	1184	1



PK1XL



PK2XL



PK3L



# Fuse base U1...3 /GZ/1500/H

General characteristics					
Type			U1XL-1IGZ/1500/H	U2XL-1IGZ/1500/H	U3L-1IGZ/1500/H
Size			NH1XL	NH2XL	NH3L
Rated voltage	V		1500	1500	1500
Rated current	A		250	400	630
Conv. free air thermal current with fuse links	A		200	315	630
Conv. free air thermal current with solid links	A		325	400	1000
Rated frequency	Hz		40-60	40-60	40-60
Max. permis. power dissipation per fuse-link	W		35	35*	70
Cable terminal - Flat terminal	Screw	–	M10	M10	M12
	Cable lug (DIN 46235)	mm <sup>2</sup>	25-240	25-240	25-300
	Flat termination	mmxmm	30x10	30x10	40x10
	Rated torque	Nm	30-35	30-35	30-35
Cable terminal - Terminal	Cross-section	mm <sup>2</sup>	KM2G	KM2G	P32
	Rated torque	Nm			
Degree of protection - Front side, device fitted	Operating conditions	–	IP00	IP00	IP00
	Gripping lug cover A-U... (available separately) applied	–	IP2X	IP2X	IP2X
Operating conditions	Ambient temperature**	°C	-25 ... +55		
	Rated operating mode	–	Uninterrupted duty		
	Actuation	–	–		
	Mounting position	–	Vertical, horizontal		
	Altitude	m	< 2000		
	Pollution degree	–	3		
	Overvoltage category	–	III		

\* with application of gPV fuse-links max. 250A: 46W

\*\* 35°C normal temperature, at 55°C with reduced operating current



## Fuse base U1...3/GZ/1500/H

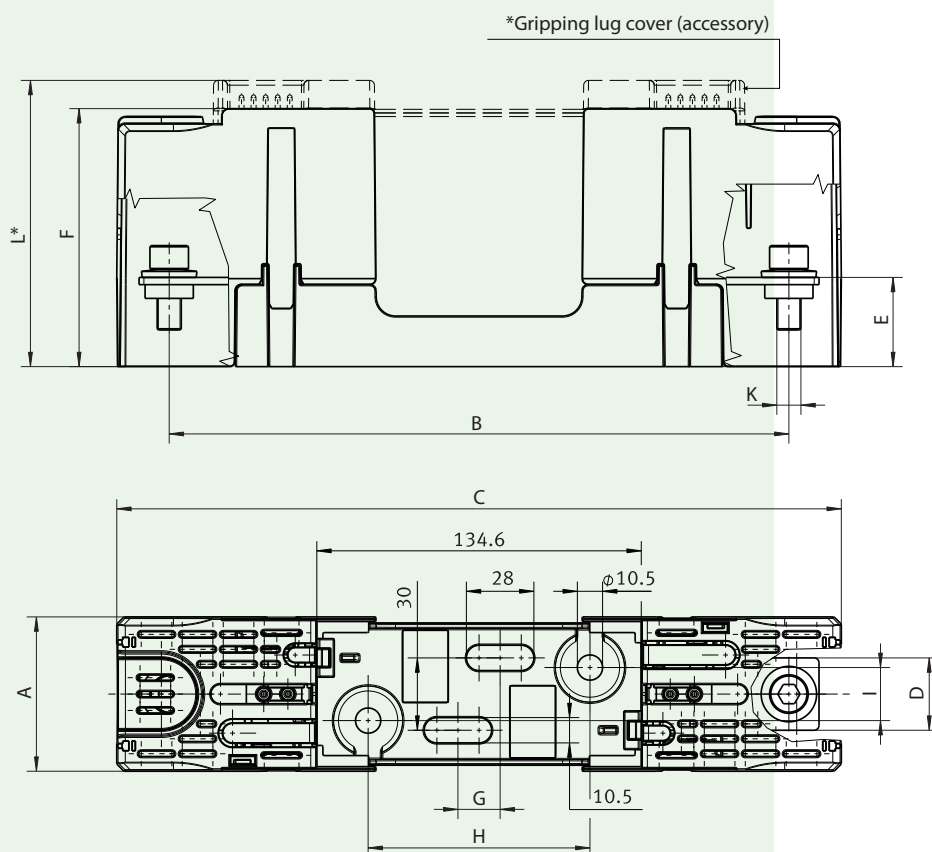
Type	I <sub>n</sub> [A]	Code No.	Max. Connection (mm <sup>2</sup> )	Weight [g]	Packaging [pcs]
U1XL-1IGZ/1500/H	250	004122060	240	600	1
U2XL-1IGZ/1500/H	400	004122061	240	600	1
U3L-1IGZ/1500/H	630	004122062	300	1000	1

## Accessories

Type	Code No.	Description	Weight [g]	Packaging [pcs]
K-U1XL-3L	004122063	Mechanical fuse monitoring	9	1
A-U1XL-2XL	004122064	Gripping lug cover	13	1
A-U3L	004122065	Gripping lug cover	32	1



Size	Dimensions [mm]										
	A	B	C	D	E	F	G	H	I	K	L*
U1XL-1IGZ/1500/H	59	257	300,5	30	37	102,5	175	92	22	M10	111
U2XL-1IGZ/1500/H	64	257	300,5	30	37	107	175	92	22	M10	119
U3L-1IGZ/1500/H	80	270	328	40	38	122,5	25	96	26	M12	1.345



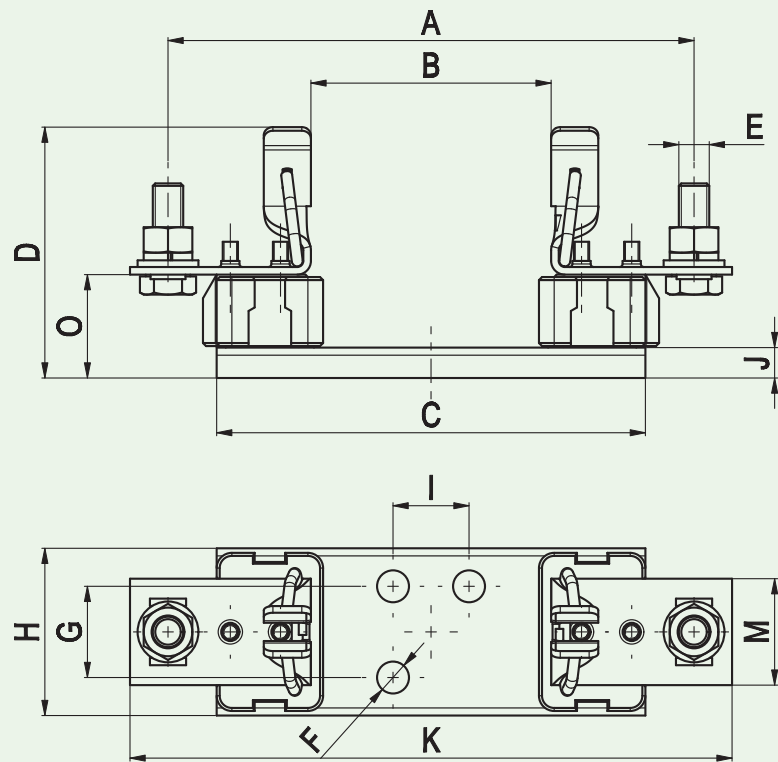
# Fuse base PK0, 1, 2, 3 DC

## General characteristics

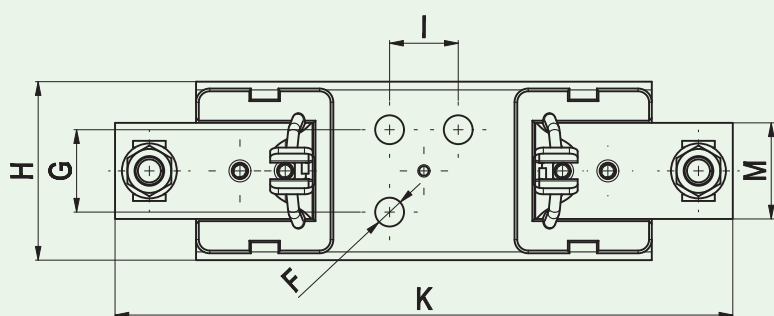
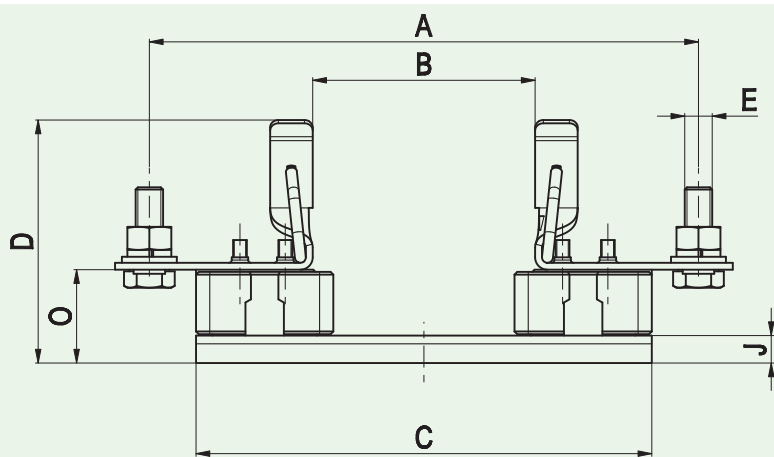
Rated voltage	1000V a.c./d.c.
Rated current	160A, 250A, 400A, 630A
Terminal torque	10 Nm, 32 Nm
Cable lugs according to DIN 46235	25-150mm <sup>2</sup> , 25-240mm <sup>2</sup> , 25-300mm <sup>2</sup>
Insulation class	C-VDE 0110
Degree of protection	IP00
Standards	EN 60269, IEC 60269, DIN VDE 0636, DIN 43620, DIN 43623

## Fuse base PK

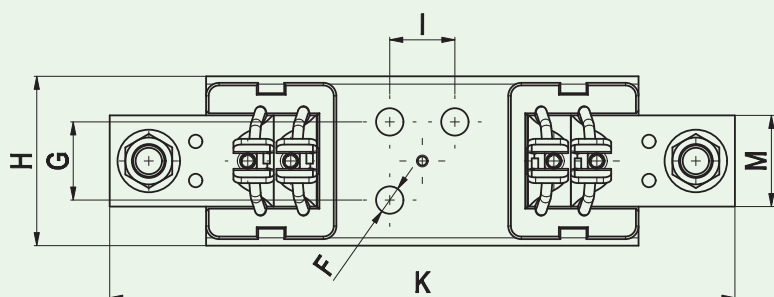
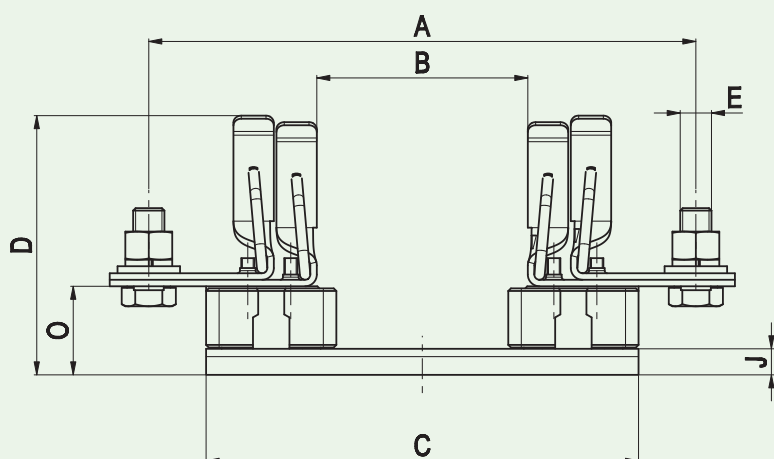
Type	I <sub>n</sub> [A]	Cable lugs according to DIN 46235 [mm <sup>2</sup> ]	Code No.	Weight [g]	Packaging [pcs]
PK0 DC	160		004122033	258	3/90
PK 1 M10-M10 DC 1000V 1p	250	25-150	004122025	605	3/18
PK 2 M10-M10 DC 1000V 1p	400	25-240	004122024	845	3/15
PK 3 M12-M12 DC 1000V 1p	630	25-300	004122023	1110	3/12



PK0, 1 DC



PK2 DC



PK3 DC



Type	Dimensions [mm]												
	A	B	C	D	E	F	G	H	I	J	K	M	O
PK0 DC	150	74	130	60	M8-M8	Ø7,5	-	33	25	4,5	170	20	25
PK1 DC	175	80	141	82	M10-M10	Ø10,5	30	55,5	25	10	200	35	35
PK2 DC	200	80	166	87	M10-M10	Ø10,5	30	65	25	10	225	35	35
PK3 DC	210	80	166	99	M12-M12	Ø10,5	30	65	25	10	240	35	35

# Fuse base U1-1 /GZ/PV

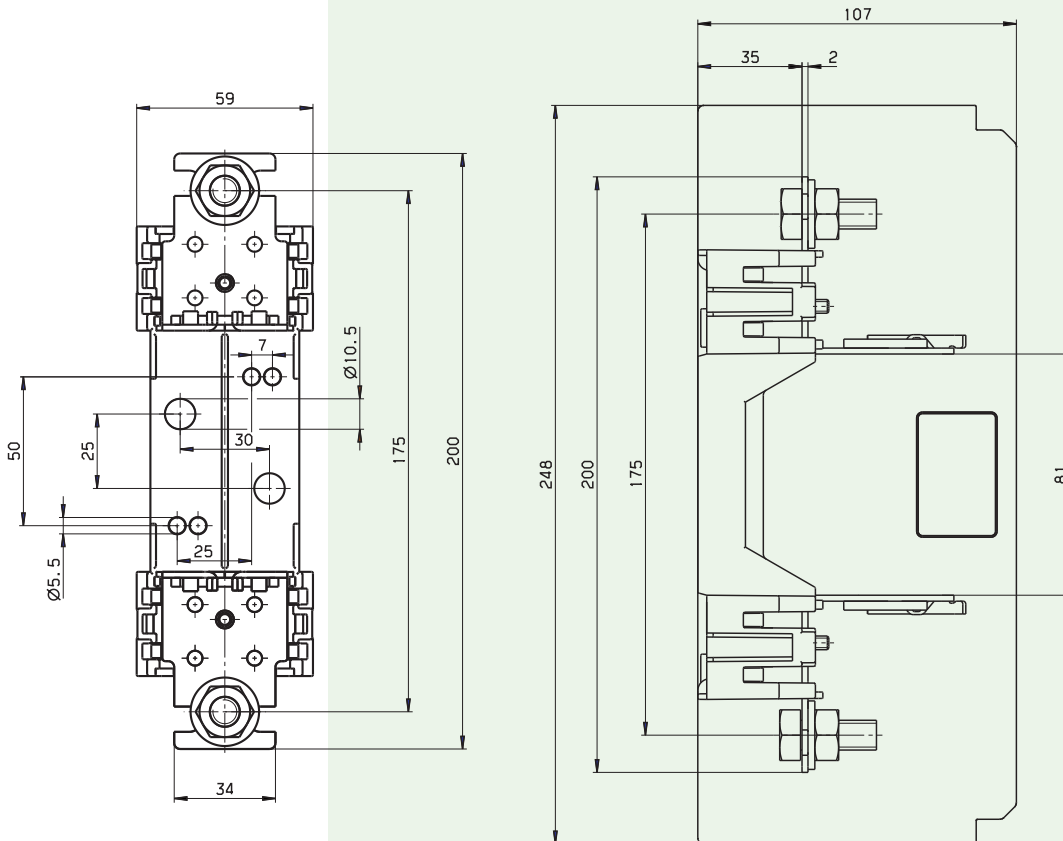


### General characteristics

Rated voltage	1000V d.c.	
Rated current	160A	
Fuse link size	1C, 1	
Conv. free air thermal current with fuse-links	160A	
Conv. free air thermal current with solid links	325A	
Max. permis. power dissipation per fuse-link	31W	
Cable terminal - Flat terminal	Screw	M10
	Cable lug (DIN 46235)	25-150 mm <sup>2</sup>
	Flat termination	30x10 mmx-mm
	Rated torque	30-35 Nm

### Fuse base U1-1/GZ/PV

Type	I <sub>n</sub> [A]	Code No.	Max. Connection (mm <sup>2</sup> )	Weight [g]	Packaging [pcs]
U1-1/GZ/PV	160	004122035	150	387	1



# Photovoltaic fuseholder TL1-1/9/1000V/PV

## General characteristics

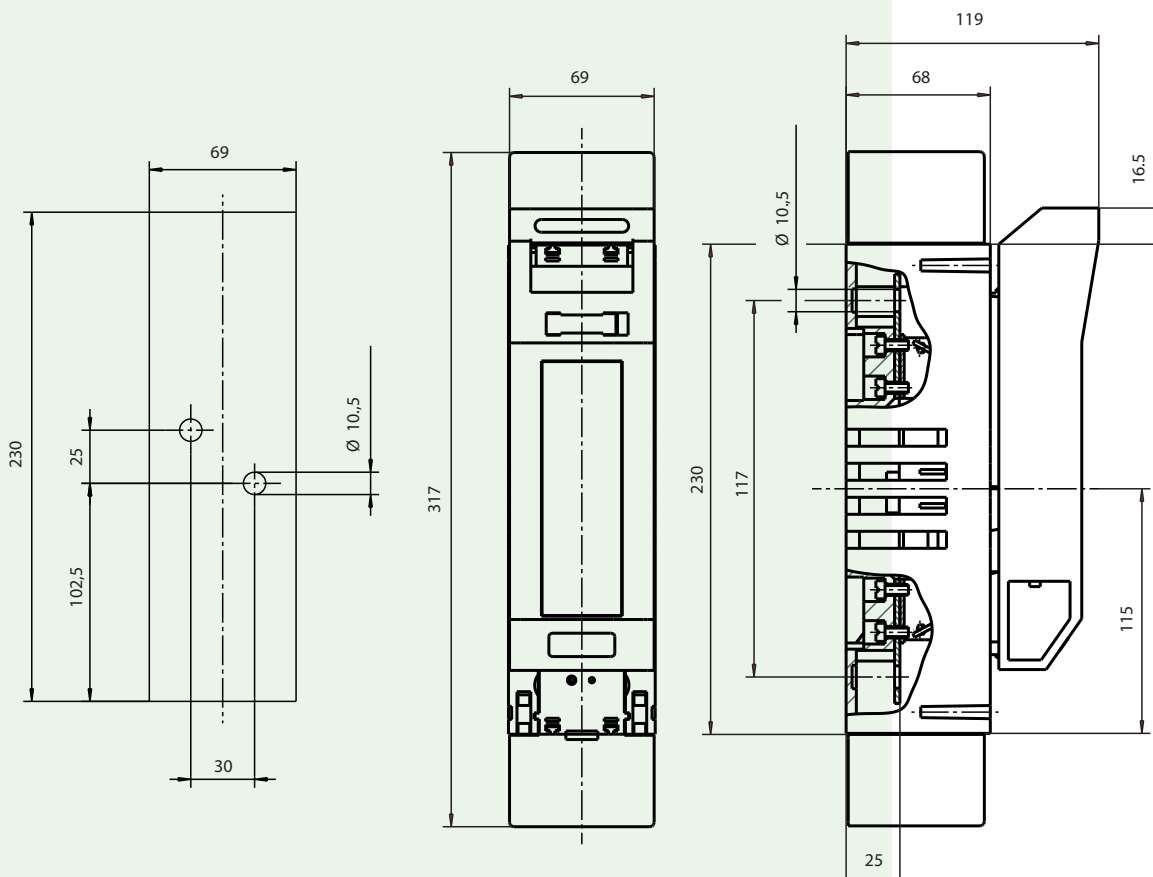
Number of poles	1	
Rated voltage	1000V d.c.	
Rated current	160A	
Conv. free air thermal current with fuse-links	160A	
Utilization category	DC-20B	
Fuse-links	Size to DIN 43620	1C, 1
	Max. rated current (gL/gG)	160A
	Max. permis. power loss per fuse-link	25W
Cable terminal - Flat terminal	Screw	M10
	Cable lug (DIN 46235)	25-240 mm <sup>2</sup>
	Flat termination	30x10 mm
	Rated torque	30-35 Nm
Type of protection - front side, device fitted	IP20, IP10	
Operating conditions	Ambient temperature*	-25 ... +55
	Rated operating mode	Cont. operation
	Actuation	Dependent manual actuation
	Mounting position	Vertical, horizontal
	Altitude	≤ 2000 m
	Pollution degree	3
	Overvoltage category	III

\*35°C normal temperature, 55°C with reduced operating current



## Photovoltaic fuseholder TL1-1/9/1000V/PV

Type	I <sub>n</sub> [A]	Code No.	Max. Connection (mm <sup>2</sup> )	Terminal	Weight [g]	Packaging [pcs]
TL1-1/9/1000V/PV	160	004122038	150	M10	1070	1



# Photovoltaic fuseholder TL1,3-1/9/1200V

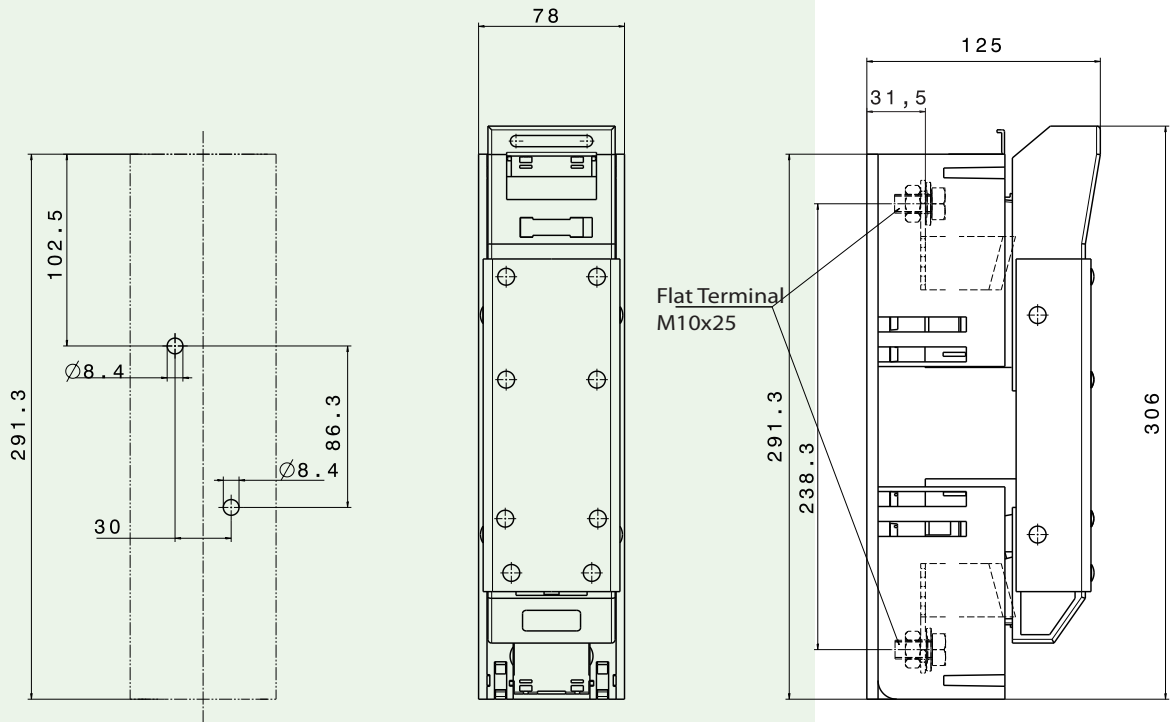
General characteristics			
Type		TL1/1200V	TL3/1200V
For NH fuse-links/extended length/acc. to DIN VDE 0636-2	Size	a1=194mm, a4=124mm	a1=209mm, a4=124mm
Rated voltage		1200V a.c. / 1000V d.c.	1200V a.c. / 1000V d.c.
Rated current		250A	630A
fuse link size		1XL	2XL, 3L
Conv. free air thermal current with fuse-links		250A	630A
Conv. free air thermal current with solid links		325A	1000A
Rated frequency		40-60 Hz	40-60Hz
Utilization category		AC-20B, DC-20B	AC-20B, DC-20B
Max. permis. power loss per fuse-link		25W	70W
Cable terminal - Flat terminal	Bolt diameter	M10	M12
	Cable lug (DIN 46235)	25-150 mm <sup>2</sup>	25-300 mm <sup>2</sup>
	Flat bar	30x10 mm	40x10 mm
	Rated torque	30-35 Nm	30-35 Nm
Type of protection - front side, device fitted	Switching cover close	IP20	IP20
	Switching cover open	IP10	IP10
Operating conditions	Ambient temperature*	-25 ... +55	
	Rated operating mode	Cont. operation	
	Actuation	Dependent manual operation	
	Mounting position	Vertical, horizontal	
	Altitude	≤ 2000 m	
	Pollution degree	3	
Overvoltage category	III		

\*35°C normal temperature, 55°C with reduced operating current

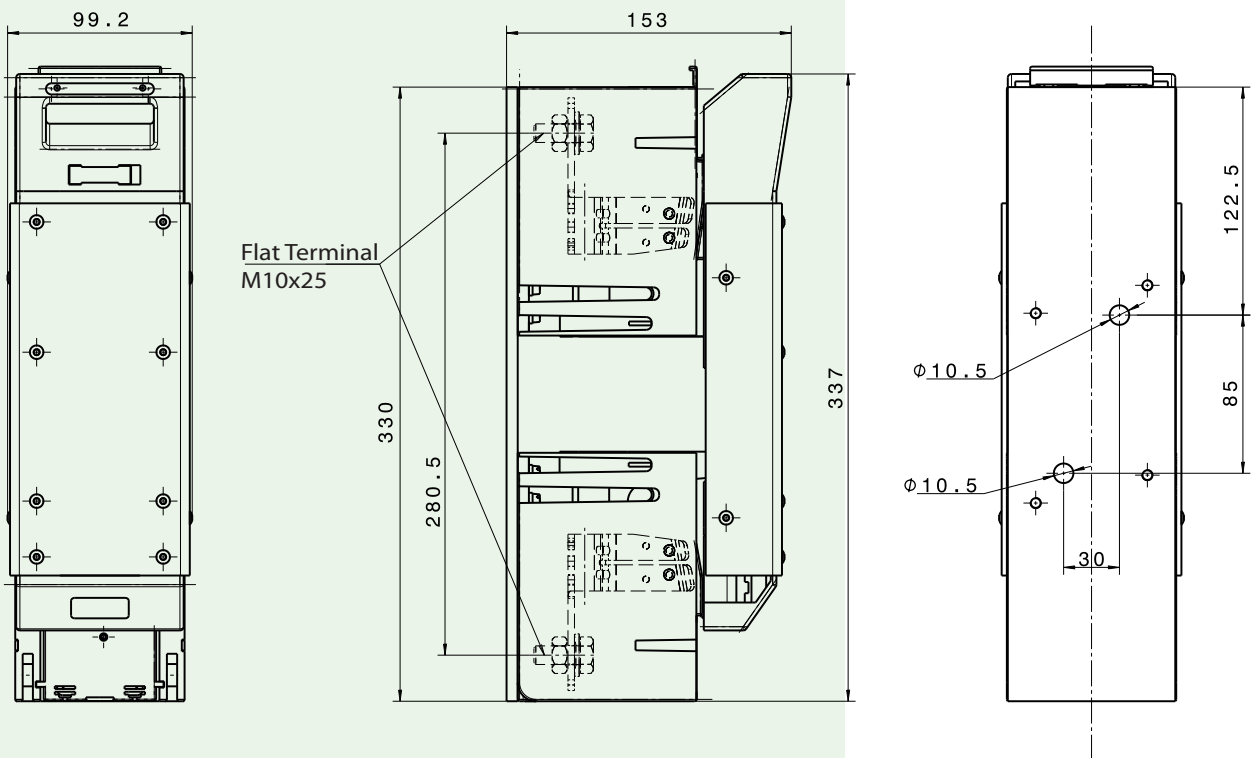


Photovoltaic fuseholder TL1,3-1/9/1200V						
Type	I <sub>n</sub> [A]	Code No.	Max. Connection (mm <sup>2</sup> )	Terminal	Weight [g]	Packaging [pcs]
TL1-1/9/1200V	250	004122036	150	M10	1485	1
TL3-1/9/1200V	630	004122037	300	M12	2535	1

**TL1-1/9/1200V**



**TL3-1/9/1200V**



# NH strip-fuseways L2,3-2 / 1200V

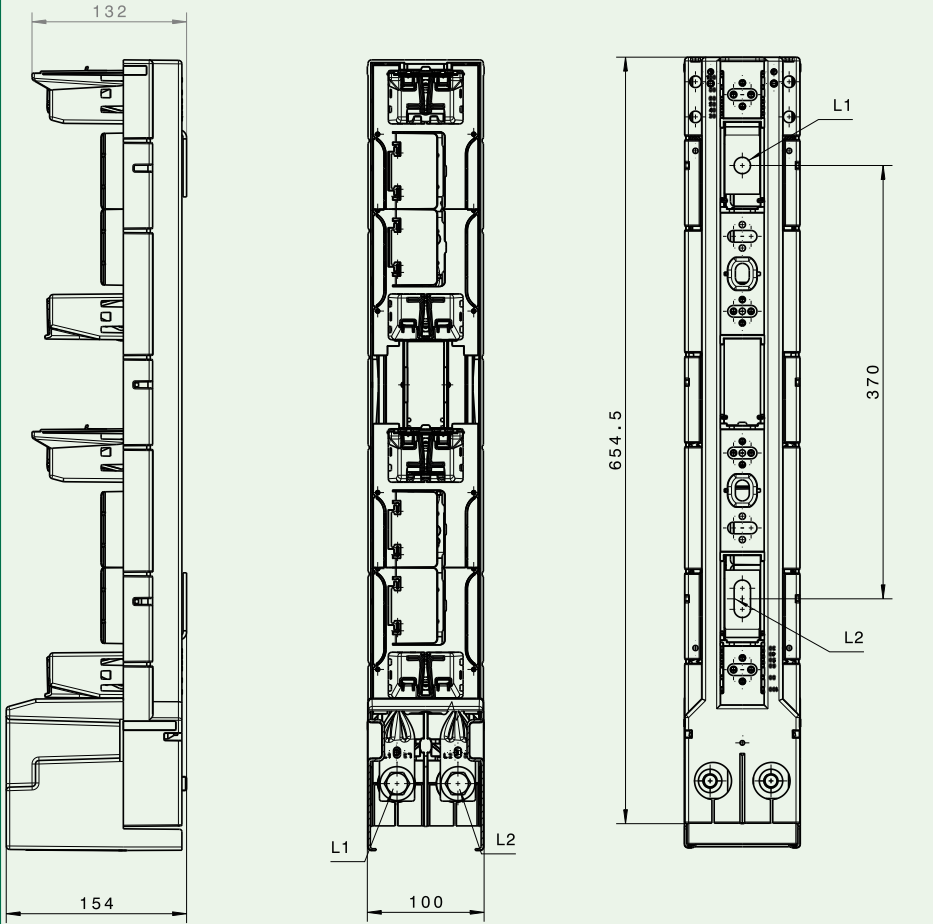
General characteristics			L2	L3
Type			L2	L3
For NH fuse-links acc. to IEC 60269-6	Size		2 (extended body)	3 (extended body)
Rated voltage			1200V d.c.	1200V d.c.
Rated current			250A	400A
fuse link size			1XL, 2XL	3L
Conv. free air thermal current with fuse-links			250A	400A
Rated insulation voltage			1200V d.c.	1200V d.c.
Max. permis. power loss per fuse-link			46W	75W
Cable terminal	Flat terminal	Bolt diameter	M12	M12
		Cable lug (DIN 46235)	1 x 25-240 mm <sup>2</sup>	1 x 25-240 mm <sup>2</sup>
		Flat bar	30x10 mm	30x10 mm
		Tightening torque	35-40 Nm	35-40 Nm
	Clamp KM2G	Clamping cross-section	25-150mm <sup>2</sup> /185-300mm <sup>2</sup>	25-150mm <sup>2</sup> /185-300mm <sup>2</sup>
		Tightening torque	32 Nm	32 Nm
	Clamp KM2G-F	Clamping cross-section	25-240 mm <sup>2</sup>	25-240 mm <sup>2</sup>
		Tightening torque	32 Nm	32 Nm
Type of protection - front side, device fitted - with front side strip cover			IP10	IP10
Operating conditions	Ambient temperature*		-25 ... +55	
	Rated operating mode		Cont. operation	
	Actuation		Dependent manual operation	
	Mounting position		Vertical	
	Altitude		≤ 2000 m	
	Pollution degree		3	
	Overvoltage category		III	

\*35°C normal temperature, 55°C with reduced operating current

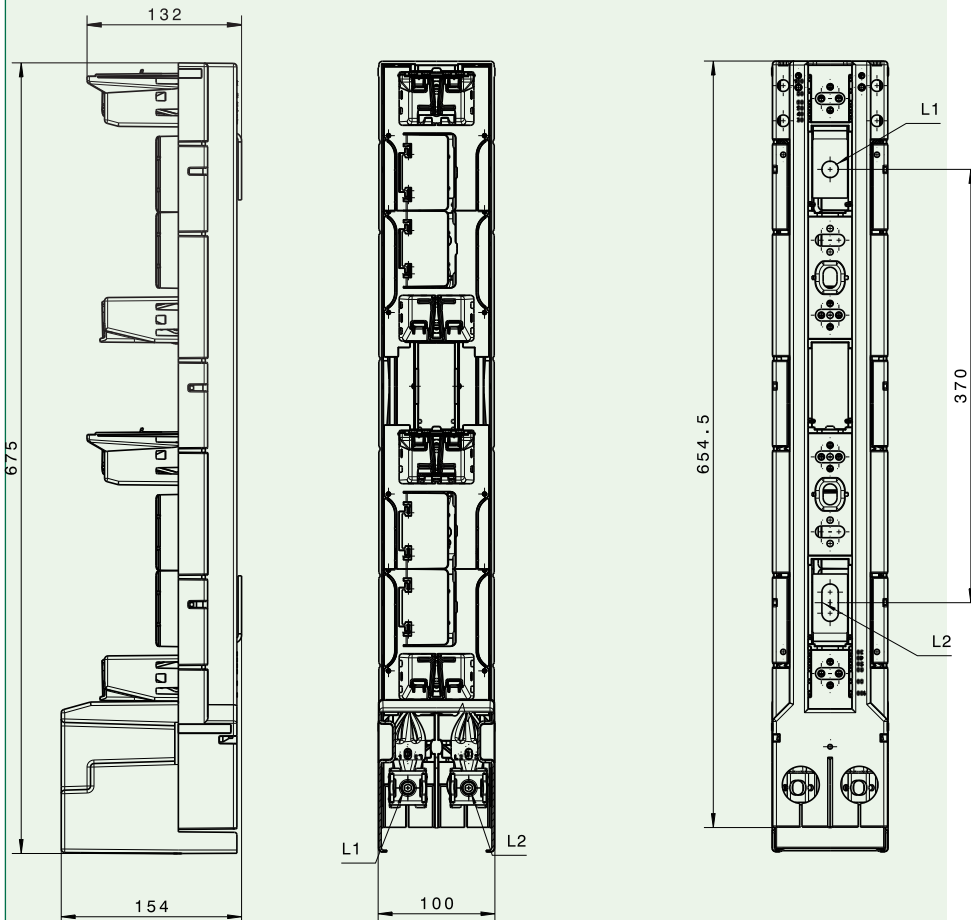
NH strip-fuseways L2,3-2/1200V						
Type	I <sub>n</sub> [A]	Code No.	Max. Connection (mm <sup>2</sup> )	Terminal	Weight [g]	Packaging [pcs]
L2-2/1200/3A/HA/PV	250	004122039	25-240	Flat terminal M12	3500	1
L2-2/1200/9/KM2G-F/HA/PV	250	004122040	25-240	Steel-frame clamp KM2G-F	3650	1
L3-2/1200/3A/HA/PV	400	004122041	25-240	Flat terminal M12	4110	1
L3-2/1200/9/KM2G-F/HA/PV	400	004122042	25-240	Steel-frame clamp KM2G-F	4260	1



**Flat terminal M12**



**Steel-frame clamp KM2G-F**

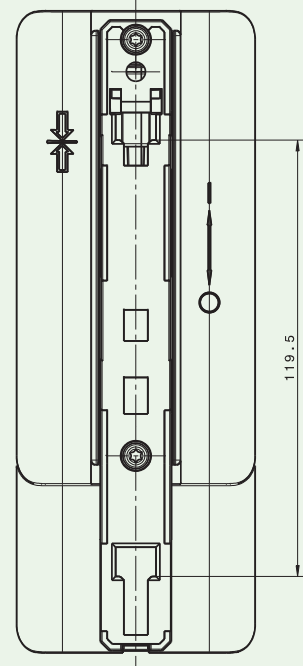
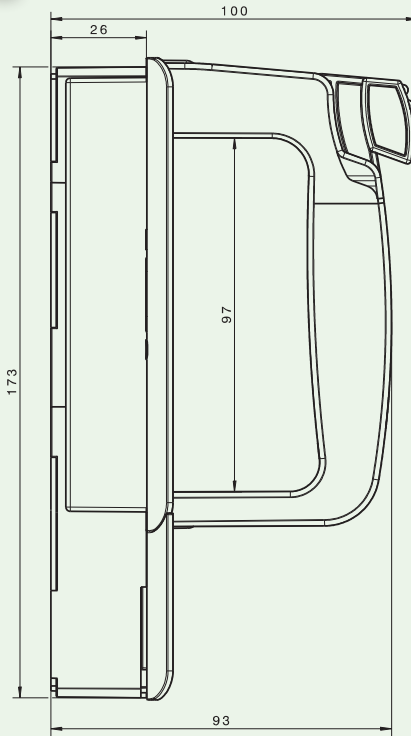
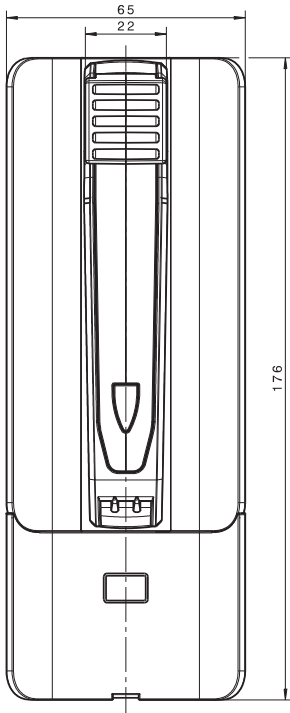


# NH handle



**NH handle for fuse link DC 1100V and DC 1500V**

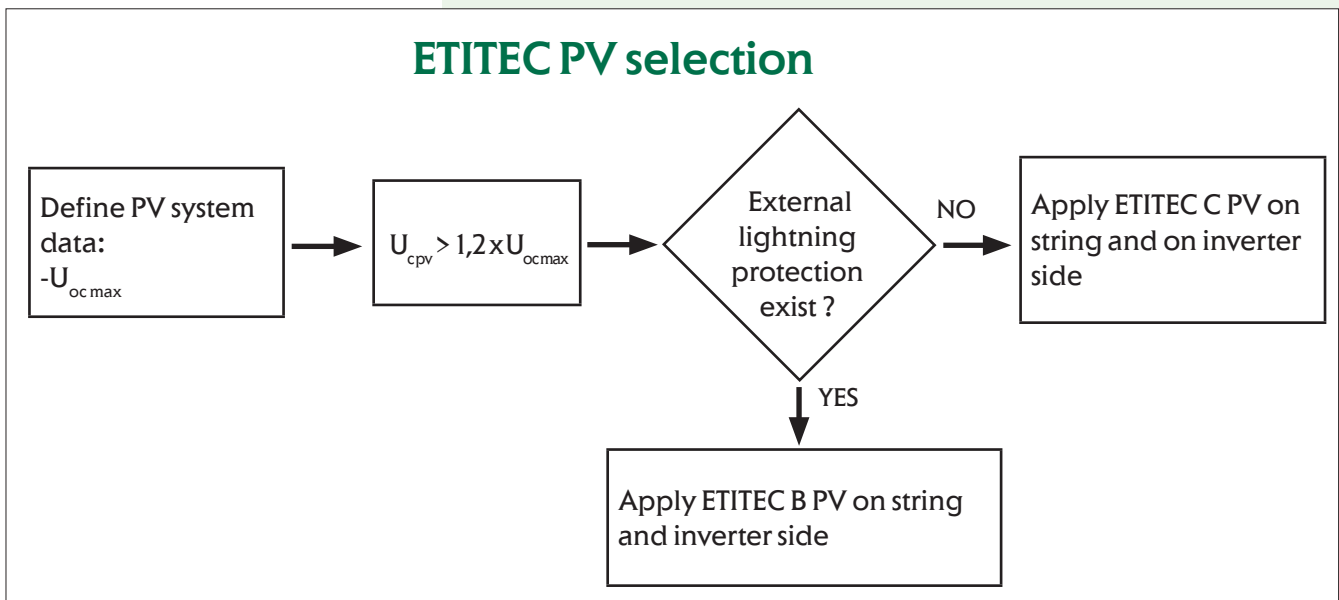
Code	Type	Weight [g]	Packaging [pcs]
001691062	GPN 1500	590	1



# ETITEC - Lightning and Surge Arresters

## Overvoltage protection selection

### ETITEC PV selection



NEW! acc. to EN 50539-11:2013

ETITEC M T12 PV ..... Y series of overvoltage surge protective devices has been developed to protect against direct and indirect discharges and is intended to protect photovoltaic systems. The circuit topology consist of three varistors stages each protected by a thermal disconnection device.

**Advantages:**

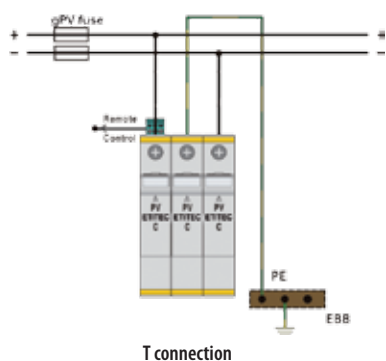
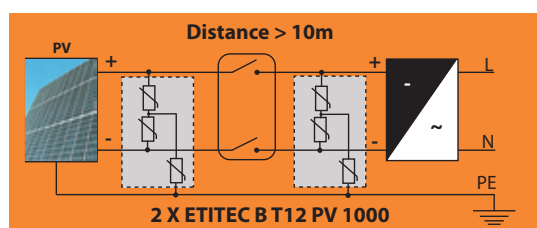
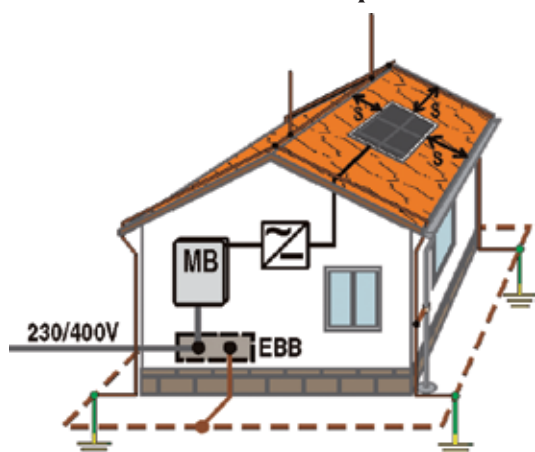
- optical indication of faulty device (green ok, red false)
- remote signalisation (RC version only)
- DIN rail mounting (EN 60715)
- high discharge currents and high degree of protection
- MOV varistor is the protective element
- metal snapper, new way of mounting on DIN rail (easier, quicker)
- modular design
- EN 50539-11: 2013
- RoHS compliant
- connection up to 35mm<sup>2</sup>

Location of Use: String box, Inverter  
 Mode of Protection:(+) - PE, (-) - PE, (+) - (-)  
 Surge Ratings: I<sub>Total</sub> =up to 12.5 kA (10/350 μs)  
 I<sub>Total</sub> =up to 50 kA (8/20 μs)  
 EN Category: Type 1+2  
 Protective Elements: High Energy MOV  
 Housing: Pluggable Design  
 Compliance: EN 50539-11:2013+A1:2014

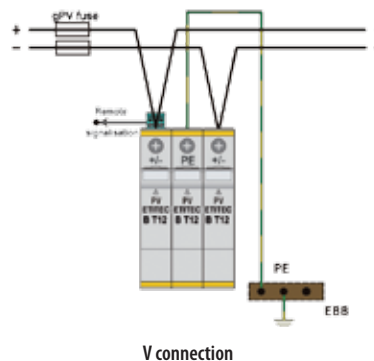


ETITEC MT12 PV 1100/12,5 Y RC

**ETITEC M T12 PV ..... Y for photovoltaic system on a building with External Lightning Protection**



T connection



V connection

Note: If distance between string and inverter is less than 10 m, then you need only one ETITEC B T12 PV.

### ETITEC M T12 PV

Type	Code No.	Max PV voltage $U_{cpv}$ [V DC]	$I_{scpv}$ [kA]	$I_{total}$ (10/350) [kA]	$I_{imp}$ [kA]	$I_n$ [kA]	Weight [g]	Packaging [pcs]
ETITEC M T12 PV 1100/12,5 Y	002440511	1100	11	12,5	6,25	20	453	1/5
ETITEC M T12 PV 1100/12,5 Y RC	002440512	1100	11	12,5	6,25	20	462	1/5
ETITEC M T12 PV 1500/10 Y	002440513	1500	11	10	5	20	488	1/5
ETITEC M T12 PV 1500/10 Y RC	002440514	1500	11	10	5	20	497	1/5



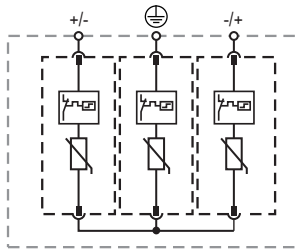
ETITEC MT12 PV 1500/10 Y

\*RC - remote contact for remote signalisation of bad module (to be replaced)

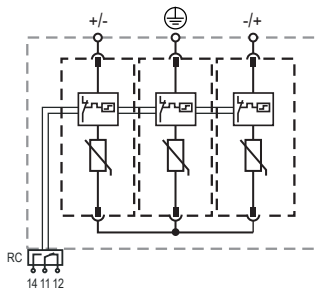
### Spare (replacement) modules

Type	Code No.	Compatible with	Weight [g]	Packaging [pcs]
MOD. MT12 PV 550/12,5	002440519	ETITEC MT12 PV 1100/12,5 Y (RC)	71	1/28
MOD. MT12 PV 550/6,25*	002440520	ETITEC MT12 PV 1100/12,5 Y (RC)	127	1/28
MOD. MT12 PV 750/10	002440521	ETITEC M T12 PV 1500/10 Y (RC)	87	1/28
MOD. MT12 PV 750/5*	002440522	ETITEC M T12 PV 1500/10 Y (RC)	13	1/28

\*left or right module (Y connection)



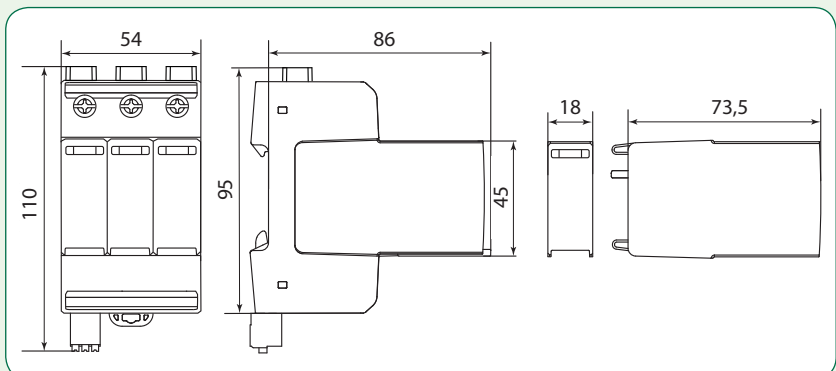
ETITEC MT2 PV ... Y



ETITEC MT2 PV ... Y RC

### Technical data

Type	ETITEC M T12 PV 1100/12,5 Y	ETITEC M T12 PV 1500/12,5 Y
	T1, T2 / I, II / B, C	
Maximum Continuous Operating DC Voltage	1100 V	1500V
Nominal Discharge Current (8/20 $\mu$ s)	20 kA	20 kA
Total Discharge Current (8/20 $\mu$ s)	50 kA	40 kA
Impulse Discharge Current (10/350)	6,25 kA	5 kA
Total Discharge Current (10/350 $\mu$ s)	12,5 kA	10 kA
Specific Energy	39 kJ/ $\Omega$	39 kJ/ $\Omega$
Charge	3,125 As	2,5 As
Voltage Protection Level	< 3,8 kV	< 5 kV
Response Time	< 25 ns	
Number of Ports	1	
Thermal Protection	✓	
Short-Circuit Current Rating	11 kA	
Operating Temperature Range	- 40°C ... +85°C	
Permissible Operating Humidity	5% - 95%	
Altitude (max)	4000 m	
Operating State / Fault Indication	Green Flag / Not Green Flag	
Conductor Cross Section (max)	35 mm <sup>2</sup> (Solid, Stranded) / 25 mm <sup>2</sup> (Flexible)	
Terminal Screw Torque	max. 4,5 Nm	
Mounting	35 mm DIN Rail, EN 60715	
Degree Of Protection	IP20	
Housing Material	Thermoplastic: Extinguishing Degree UL 94 V-0	
Size	3 modules	
<b>Remote contacts - type ...RC</b>		
Contacts ratings	AC: 250V/1A; 125V/1A; DC: 48V/0,5A, 24V/0,5A, 12V/0,5A	
Terminal cross section	Max. 1,5 mm <sup>2</sup>	
Terminal screw torque	0,25 Nm	
Standards	EN 50539-11:2013+A1:2014	



**NEW! acc. to EN 50539-11:2013**

ETITEC M T2 PV ..... Y series of overvoltage surge protective devices has been developed to protect against indirect discharges and is intended to protect photovoltaic systems. The circuit topology consist of two (three) varistors stages each protected by a thermal disconnection device.

**Advantages:**

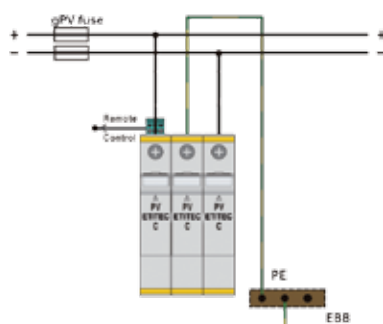
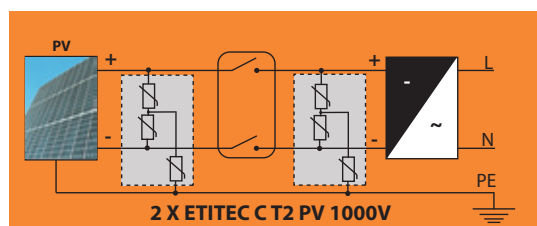
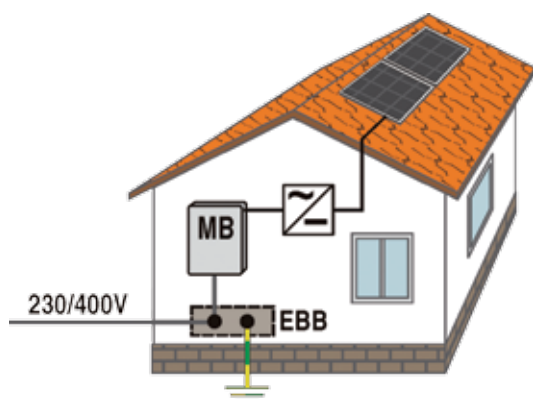
- optical indication of faulty device (green ok, red false)
- remote signalisation (RC version only)
- DIN rail mounting (EN 60715)
- high discharge currents and high degree of protection
- MOV varistor is the protective element
- metal snapper, new way of mounting on DINrail (easier, quicker)
- modular design
- EN 50539-11:2013
- RoHS compliant
- connection up to 35mm<sup>2</sup>

Location of Use: String box, Inverter  
 Mode of Protection:(+) - PE, (-) - PE, (+) - (-)  
 Surge Ratings:  $I_{Total}$  =up to 20 kA (8/20  $\mu$ s)  
 $I_{Total}$  =up to 50 kA (8/20  $\mu$ s)  
 EN Category: Type 2  
 Protective Elements: High Energy MOV  
 Housing: Pluggable Design  
 Compliance: EN 50539-11:2013+A1:2014

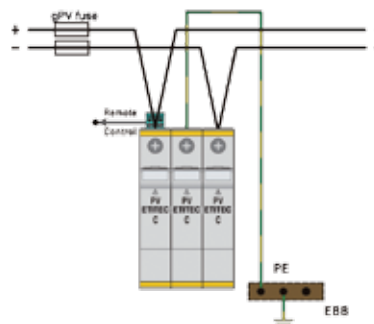


ETITEC MT2 PV 1500/20 Y RC

**ETITEC M T2 PV ..... Y for photovoltaic system on a building without External Lightning Protection**



T connection ETITEC C T2 PV

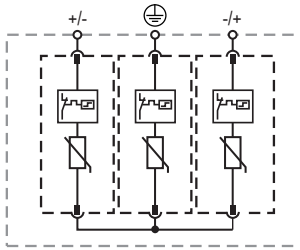


V connection ETITEC C T2 PV

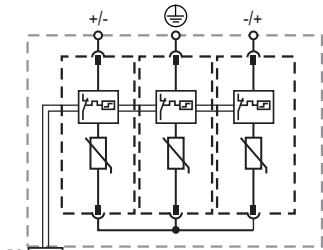
Note: If distance between string and inverter is less than 10 m, then you need only one ETITEC (C) T2 PV.



ETITEC M T2 PV 1100/20 Y



ETITEC M T2 PV ... Y



ETITEC M T2 PV ... Y RC

### ETITEC M T2 PV

Type	Code No.	Max PV voltage $U_{cpv}$ [V DC]	$I_{scpv}$ [kA]	$I_n/I_{max}$ [kA]	Weight [g]	Packaging [pcs]
ETITEC M T2 PV 1100/20 Y	002440515	1100	11	20/40	396	1/5
ETITEC M T2 PV 1100/20 Y RC	002440516	1100	11	20/40	406	1/5
ETITEC M T2 PV 1500/20 Y	002440517	1500	11	20/30	444	1/5
ETITEC M T2 PV 1500/20 Y RC	002440518	1500	11	20/30	454	1/5

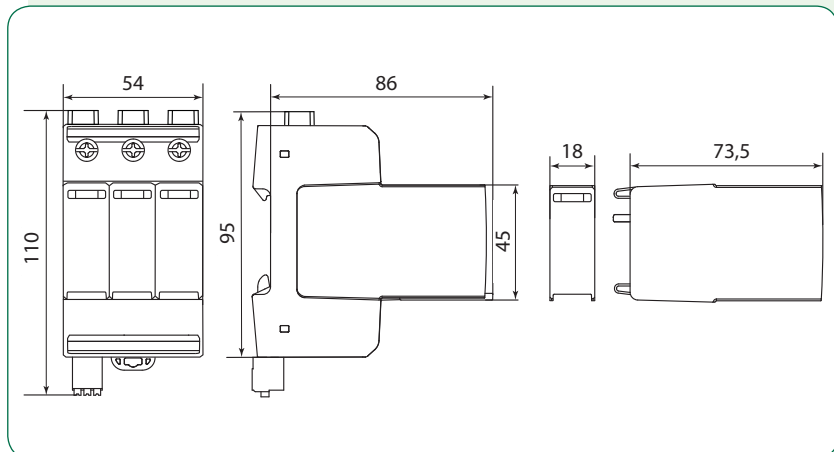
\*RC - remote contact for remote signalisation of bad module (to be replaced)

### Spare (replacement) modules

Type	Code No.	Compatible with	Weight [g]	Packaging [pcs]
MOD. M T2 PV 550/20	002440523	ETITEC M T2 PV 1100/20 Y (RC)	0,071	1/28
MOD. M T2 PV 750/20	002440524	ETITEC M T2 PV 1500/20 Y (RC)	0,087	1/28

### Technical data

Type	ETITEC M T2 PV 1100/20 Y	ETITEC M T2 PV 1500/20 Y
	T2 / II / C	
Maximum Continuous Operating DC Voltage	1100 V	1500V
Nominal Discharge Current (8/20 $\mu$ s)	20 kA	20 kA
Maximum Discharge Current (8/20 $\mu$ s)	40 kA	30 kA
Total Discharge Current	50 kA	40 kA
Voltage Protection Level	< 3,8 kV	< 5 kV
Response Time	< 25 ns	
Number of Ports	1	
Thermal Protection	✓	
Short-Circuit Current Rating	11 kA	
Operating Temperature Range	- 40°C ... +85°C	
Permissible Operating Humidity	5% - 95%	
Altitude (max)	4000 m	
Operating State / Fault Indication	Green Flag / Not Green Flag	
Conductor Cross Section (max)	35 mm <sup>2</sup> (Solid, Stranded) / 25 mm <sup>2</sup> (Flexible)	
Terminal Screw Torque	max. 4,5 Nm	
Mounting	35 mm DIN Rail, EN 60715	
Degree Of Protection	IP20	
Housing Material	Thermoplastic: Extinguishing Degree UL 94 V-0	
Size	3 modules	
<b>Remote contacts - type ...RC</b>		
Contacts ratings	AC: 250V/1A; 125V/1A; DC: 48V/0,5A, 24V/0,5A, 12V/0,5A	
Terminal cross section	Max. 1,5 mm <sup>2</sup>	
Terminal screw torque	0,25 Nm	
Standards	EN 50539-11:2013+A1:2014	



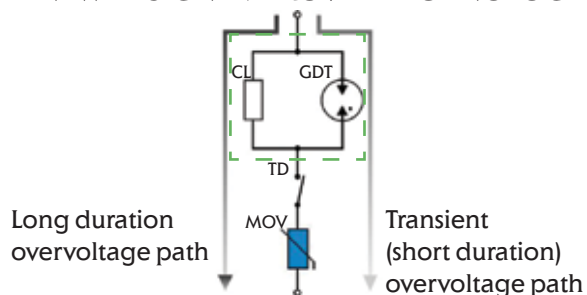


### Advantages:

- Current limiting for long duration; overvoltage path through MOV - no degradation, long life guaranteed
- Improved thermal disconnection mechanism - rotating barrier, secure arcing shutdown, no risk of fire

**5 YEAR WARRANTY!**

### NEW DESIGN-IMPROVED TECHNOLOGY



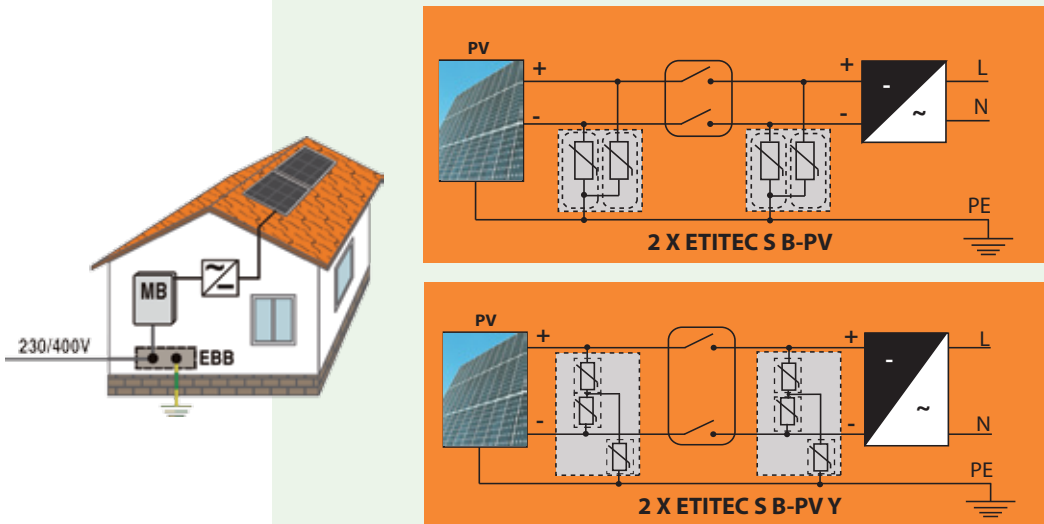
- Gas Discharge Tube - GDT
- Current Limiter - CL
- Thermal Disconnecter - TD
- Metal Oxide Varistor - MOV



## ETITEC S B-PV (IEC/EN/VDE: I, II/1,2/B+C) with $I_{imp} = 12,5 \text{ kA/pole}$

ETITEC S B-PV series of overvoltage surge protective devices has been developed to protect against direct and indirect lightning discharges and is intended to protect photovoltaic systems. The circuit topology consist of two(V configuration) or three(Y configuration) varistor stages each protected by a thermal disconnection device.

### ETITEC S B-PV for photovoltaic system on a building with External Lightning Protection



Note: If distance between string and inverter is less than 10 m, then you need only one SPD

#### General characteristics

Category IEC/EN/VDE Class I, II/Type 1,2/B+C	High surge discharge ratings: $I_{imp} = 12,5 \text{ kA/pole}$ $I_{n,max} = 40 \text{ kA/pole}$
Location of use: PV systems	Internal protection and safety: Current limiter, GDT and thermal disconnector with arc cutter for each MOV block
Protective element : High Energy MOVs	Status indication: Mechanical flag + remote signalization contacts (RC)



#### ETITEC S B - PV

Type	Code No.	$U_{OPV}$ [V DC]	$I_{imp}$ [kA]	$I_n/I_{n,max}$ [kA]	Weight [g]	Packaging [pcs]
ETITEC S B-PV 300/12,5	002440258	300	12,5	20/40	147	3
ETITEC S B-PV 300/12,5 RC	002440259	300			149	3
ETITEC S B-PV 600/12,5	002440260	600			154	3
ETITEC S B-PV 600/12,5 RC	002440261	600			155	3
ETITEC S B-PV 600/12,5 Y	002440262	600			295	2
ETITEC S B-PV 600/12,5 Y RC	002440263	600			300	2
ETITEC S B-PV 1000/12,5	002440264	1000			267	3
ETITEC S B-PV 1000/12,5 RC	002440265	1000			269	3
ETITEC S B-PV 1000/12,5 Y	002440266	1000			315	2
ETITEC S B-PV 1000/12,5 Y RC	002440267	1000			320	2
ETITEC S B-PV 1200/12,5 Y	002440268	1200			550	2
ETITEC S B-PV 1200/12,5 Y RC	002440269	1200			555	2
ETITEC S B-PV 1500/12,5 Y	002440270	1500			580	2
ETITEC S B-PV 1500/12,5 Y RC	002440271	1500			585	2

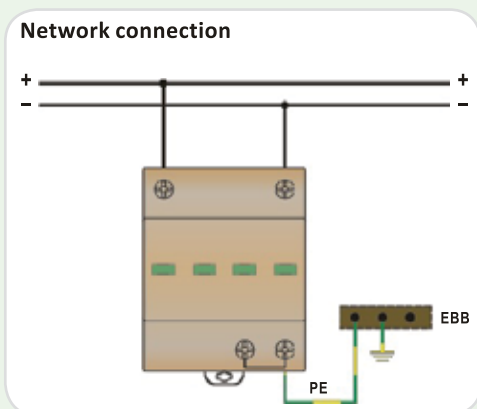
\*RC - Remote signalization contacts

$U_c > 1,2 \times U_{ocstc}$  (open circuit voltage under standard test conditions)

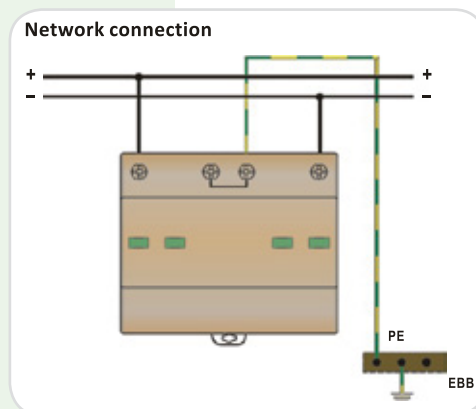
LF - Leakage free version available upon request



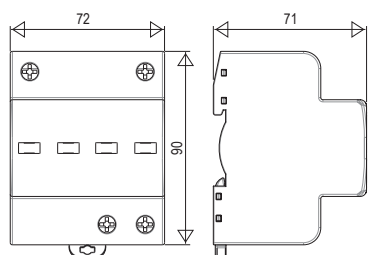
V configuration  
ETITEC S B-PV U<sub>c</sub>/I<sub>imp</sub>



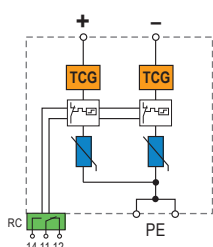
Y configuration  
ETITEC S B-PV U<sub>c</sub>/I<sub>imp</sub> Y



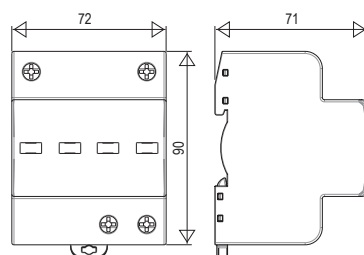
Dimensions



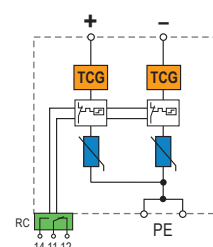
Internal configuration



Dimensions



Internal configuration



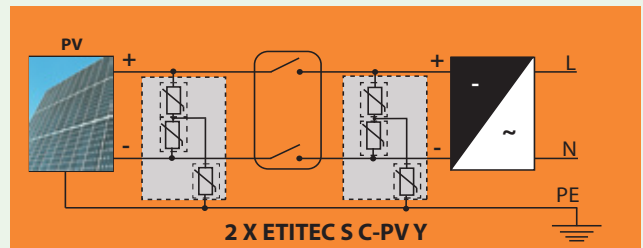
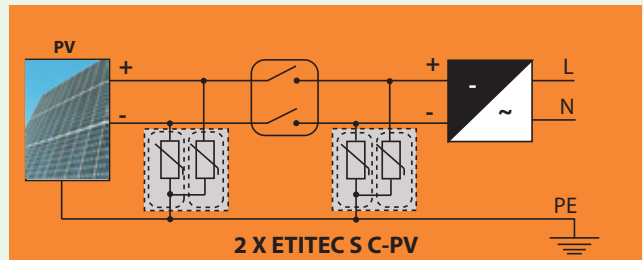
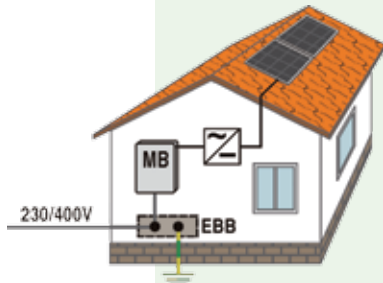
### Technical data

Type	ETITEC S B-PV U <sub>c</sub> /I <sub>imp</sub>			ETITEC S B-PV U <sub>c</sub> /I <sub>imp</sub> Y			
	300	600	1000	600	1000	1200	1500
<b>Electrical characteristics</b>							
Max. continuous operating voltage U <sub>cpv</sub> (DC)	300V	600V	1000V	600V	1000V	1200V	1500V
Nominal discharge current I <sub>n</sub> (8/20)	20kA			20kA			
Max. discharge current I <sub>max</sub> (8/20)	40kA			40kA			
Impulse current I <sub>imp</sub> (10/350)	12,5kA			12,5kA			
Short circuit withstand I <sub>scpv</sub>	200A						
Protection level U <sub>p</sub>	< 1.5kV	< 2.2kV	< 2.8kV	< 3.0kV	< 3.3kV	< 3.8kV	< 4.5kV
Residual voltage at I <sub>imp</sub> U <sub>res</sub>	< 1.3kV	< 2.0kV	< 2.6kV	< 3.0kV	< 3.3kV	< 3.8kV	< 4.5kV
Follow current I <sub>f</sub>	x						
Response time t <sub>A</sub>	< 25ns						
Thermal protection	✓						
<b>Mechanical characteristics</b>							
Temperature range	-40°C ... +80°C						
Terminal screw torque	max. 4.5Nm						
Terminal cross section	35mm <sup>2</sup> (solid)/25mm <sup>2</sup> (stranded)						
Mounting EN 60715	35mm top-hat rail						
Degree of protection	IP 20						
Housing material	Thermoplastic; extinguishing degree UL 94 V-0						
Remote contacts	✓						
Contact ratings	AC: 250V/0.5A; 125V/3A						
Terminal cross section	max. 1.5mm <sup>2</sup>						
Remote terminal torque	0.25Nm						

## ETITEC S C-PV (EN/IEC/VDE: T2, II, C) with $I_n=20\text{kA/pole}$

ETITEC S C-PV series of overvoltage surge protective devices has been developed to protect against indirect discharges and is intended to protect photovoltaic systems. The circuit topology consist of two (V configuration) or three (Y configuration) varistor modules, each protected by a thermal disconnection device. For additional protection, modules have built in current limiter, high performance GDT, thermal control function and mechanical arc prevention (cutter).

### ETITEC S C-PV for photovoltaic system on a building without External Lightning Protection



Note: If distance between string and inverter is less than 10 m, then you need only one SPD

Technical data							
Type	ETITEC S C-PV xxxxx/20				ETITEC S C-PV XXXXX/20 Y		
	75	300	600	1000	1000	1200	1500
In accordance with	EN 50539-11						
Max. continuous operating voltage $U_{opv}$ (DC)	75V	300V	600V	1000 V	1000 V	1200 V	1500 V
Nominal discharge current $I_n$ (8/20)	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Max. discharge current $I_{max}$ (8/20)	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA
Protection level $U_p$ at $I_n$ (8/20)	< 0,6 kV	< 1,6 kV	< 2,2 kV	< 2,8 kV	< 4,0 kV	< 4,4 kV	< 4,8kV
Short circuit withstand $I_{scpv}$	200A						
Follow current $I_f$	No						
Response time $t_A$	< 25 ns						
Thermal protection	yes						
Temperature range	-40°C ... +80°C						
Terminal cross section	35 mm <sup>2</sup> (solid) / 25 mm <sup>2</sup> (stranded)						
Terminal screw torque	Max. 3,0 Nm						
Mounting EN 60715	35 mm top-hat rail						
Degree of protection	IP20						
Housing material	Thermoplastic, extinguishing degree UI 94 V-0						
Dimensions DIN 43880	2 TE	2 TE	2 TE	2 TE	3 TE	3 TE	3 TE
Remote contacts - type ...RC							
Contacts ratings	AC 250 V / 0,5 A; 125 V / 3 A						
Terminal cross section	Max. 1,5 mm <sup>2</sup>						
Terminal screw torque	0,25 Nm						
Packaging dimensions (WxHxL)	76,5 mm x 41,5 mm x 109 mm				76,5 mm x 60 mm x 109 mm		

$I_n/I_{max}$  value can be changed according to standard demands

General characteristics	
Category IEC/EN/VDE Class II/Type 2/C	High surge discharge ratings: $I_n = 20\text{kA}/\text{per pole}$ , $I_{max} = 40\text{kA}/\text{per pole}$
Location of use: PV systems	Internal protection and safety: Current limiter, GDT and thermal disconnecter with arc cutter for each MOV block
Protective element : High Energy MOVs	Status indication: Mechanical flag + remote signalization contacts (RC)

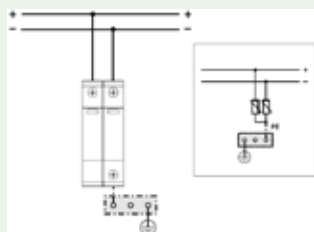
ETITEC S C - PV					
Type	Code No.	$U_{cpv}$ [V DC]	$I_n/I_{max}$ [kA]	Weight Estimated [g]	Packaging [pcs]
ETITEC S C-PV 75/20 RC	002445301	75	20/40	132	1
ETITEC S C-PV 75/20	002445302	75		130	1
ETITEC S C-PV 300/20 RC	002445303	300		202	1
ETITEC S C-PV 300/20	002445304	300		200	1
ETITEC S C-PV 600/20 RC	002445305	600		280	1
ETITEC S C-PV 600/20	002445306	600		278	1
ETITEC S C-PV 1000/20 RC	002445300	1000		290	1
ETITEC S C-PV 1000/20 Y RC	002445307	1000		398	1
ETITEC S C-PV 1000/20	002445308	1000		288	1
ETITEC S C-PV 1000/20 Y	002445309	1000		396	1
ETITEC S C-PV 1200/20 Y RC	002445310	1200		386	1
ETITEC S C-PV 1200/20 Y	002445311	1200		388	1
ETITEC S C-PV 1500/20 Y RC	002445312	1500		402	1
ETITEC S C-PV 1500/20 Y	002445313	1500	400	1	
MODULES					
MOD.ETITEC S C-PV 75/20	002445320	75		78	12
MOD.ETITEC S C-PV 300/20	002445321	300		78	12
MOD.ETITEC S C-PV 600/20	002445322	600		78	12
MOD.ETITEC S C-PV 1000/20	002445323	1000		78	12
MOD.ETITEC S C-PV 1000/20 Y	002445324	1000		78	12
MOD.ETITEC S C-PV 1200/20 Y	002445325	1200		78	12
MOD.ETITEC S C-PV 1500/20 Y	002445326	1500		78	12

\*RC - Remote signalization contacts  
 $U_c > 1,2 \times U_{ocstc}$  (open circuit voltage under standard test conditions)

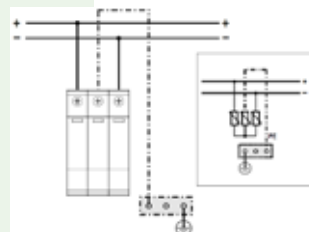


For signal, control lines and communication SPD protection (Ethernet, RS485) check our catalogue Building and industry(1+2) under program group ETITEC

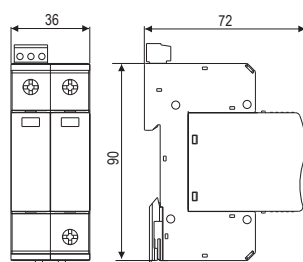
ETITEC S C-PV 75...1000/20  
V configuration



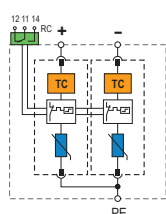
ETITEC S C-PV 1000...1500/20 Y  
Y configuration



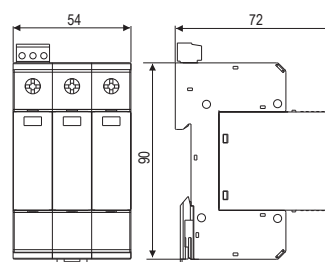
Dimensions



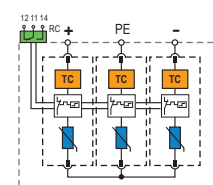
Internal configuration



Dimensions



Internal configuration



# ETITEC V T2 690V (EN/IEC/VDE: T2/II/C)

ETITEC V series of overvoltage surge protective devices has been developed to protect the new generation PV network inverters with an output voltage of 800V. The circuit topology consist of three (four) parallel-connected varistor modules. Each pole is equipped with a visual indication.

### Advantages:

Type 2 AC Surge Protector DS4x S-xxx/G

- $I_n$  : 20 kA
- $I_{max}$  : 40 kA
- Pluggable module for each phase
- Remote signaling option
- IEC 61643-11 and EN 61643-11 compliance
- UL1449 ed.4



ETITEC V T2 690/20 3+0 RC

### ETITEC V T2

Type	Code No.	$I_n/I_{max}$ [kA]	$U_{cpv}$ [V DC]	Network	Weight [g]	Packaging [pcs]
ETITEC V T2 690/20 3+0 RC	002442988	20/40	750	TNC	319	1/24
ETITEC V T2 690/20 4+0 RC	002442989	20/40	750	TNC-S	420	1/18

### Designation:

**ETITEC V T2 xxx/20 p+c RC**

**xxx** - voltage  $U_c$  (max. operating voltage AC), must be above the mains voltage

**20** - 20kA (8/20us)

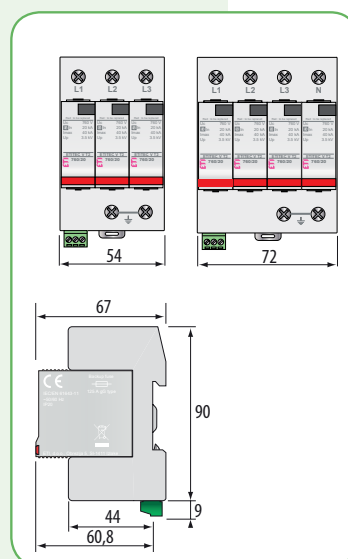
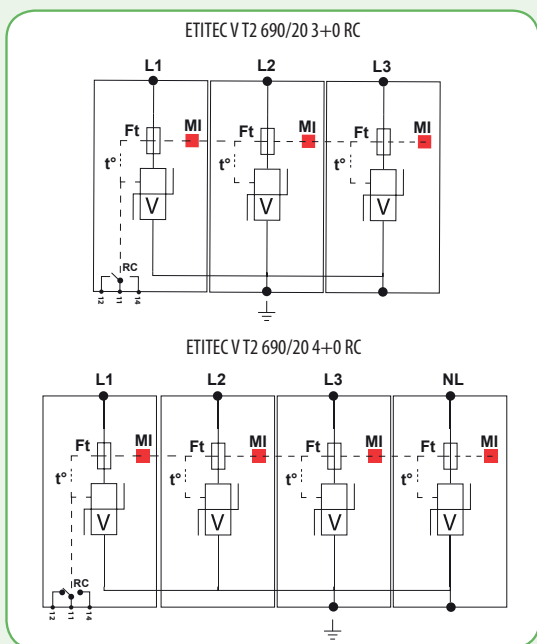
**p** - number of poles with varistors MOV

**c** - 0 varistors MOV at the NPE pole, 1 gas-discharge GDT (TT systems)

**RC** - Remote signaling contact

### Technical data

Type	ETITECV T2 690/20
Class (IEC/EN/VDE)	II/T2/C
Network (TN)	690 V/1f
Max. AC operating voltage (AC) $U_c$	760 V
Temporary Over Voltage Characteristics (TOV) $U_T$ (AC)	1000 V/5s выдерживает 1300V/120 min безоп. отключ.
Residual current $I_{pe}$	< 1 mA
Follow current $I_f$	none
Nominal discharge current $I_n$ (15 imp. x 8/20)	20 kA
Max. discharge current $I_{max}$ (8/20)	40 kA
Protection level $U_p$	3,5 kV
Admissible short-circuit current $I_{SCCR}$	25 000A
Thermal disconnector	internal
Fuses	125 A gG
Installation ground fault breaker	Type «S» or delayed
Connection to Network	By screw terminals: 2,5-25 mm <sup>2</sup> / by bus
Disconnection indicator	1 mechanical indicator
Remote signaling of disconnection (RC)	✓
Mounting	Symmetrical rail 35 mm (EN60715)
Operating temperature	- 40°C ... +85°C
Protection rating	IP 20
Housing material	Thermoplastic UL94-V0
Standards	IEC 61643-11 / EN 61643-11



# PV switch disconnector LS DC

The construction of the switch ensures reliable switching up to 58A with 1000V in the category DC 21B. The construction of the contacts and the material selection guarantee that no oxidation (small switching frequency develops, and is thus prevented inadmissible heating-up). The switch disconnector has 2, 4 or 4+2 contacts, by serial / paralel wiring of the contacts the contact rating will be increased. The switching speed at the manually operated handle does not have an effect on the switching attitude of the contacts.



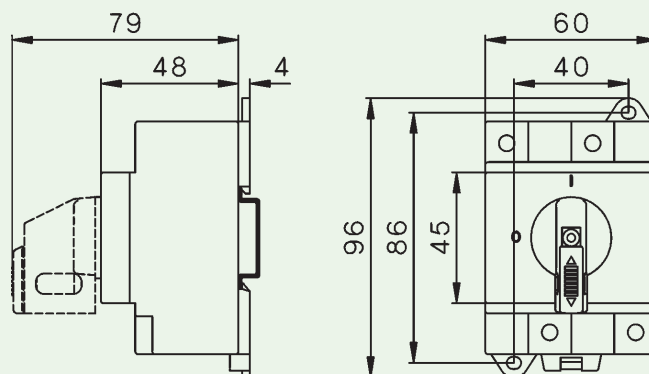
### General characteristics

Rated voltage	≤ 1000V d.c.
Rated current	≤ 58A d.c.
Standards	IEC 60364-7-712
Application	For interrupting the DC/AC inverter from the solar panels

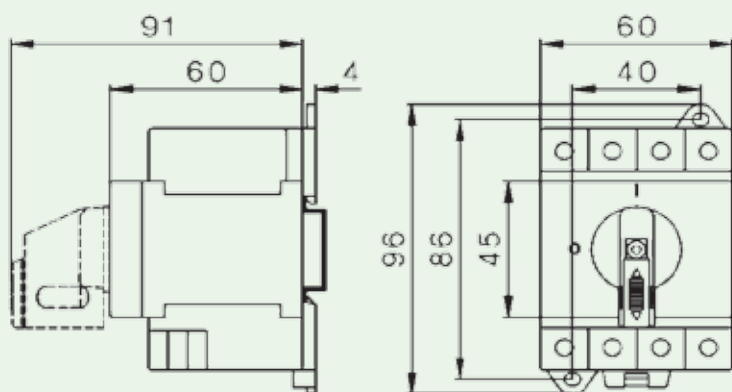
### PV switch disconnector for photovoltaic systems

Code	Type		Weight [g]	Packaging [pcs]
004660060	LS16 SMA A2	2-pole	150	1
004660061	LS25 SMA A2			
004660062	LS32 SMA A2			
004660063	LS16 SMA A4	4-pole	430	1
004660064	LS25 SMA A4			
004660065	LS32 SMA A4			
004660066	LS32 SMA A4+2	4+2 pole	430	1
004660067*	LSV-B1	-	6,6	100

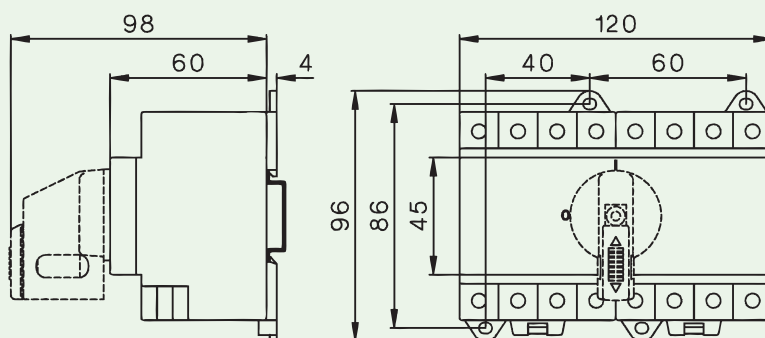
Switch disconnectors "LS.." are switch gears for interrupting DC/AC-inverter from the solar-panels. Photovoltaic-installations have to be equipped with DC-isolators according to IEC 60364-7-712.  
\*Insulated Jumper



LS16, 25, 32 2p



LS16, 25, 32 4p



LS32 A4+2

			LS16 [A]	LS25 [A]	LS32 [A]				
	2 pole in series A2	500V	16	25	32	DC22B	7	8	9
		600V	16	25	32		5,5	6	6,5
		800V	16	20	21		2	2,5	3
		1000	9	11	13		1	1,5	2
		1200V	6	8	10		-	-	-
		1500V	3	4	5		-	-	-
	4 poles in series A4	500V	16	25	32		16	25	32
		600V	16	25	32		16	25	27,5
		800V	16	25	32		11,5	12	12,5
		1000	16	25	32		8	9	10
		1200V	16	25	32	-	-	-	
		1500V	16	20	23	-	-	-	
	4 poles in series + 2 poles parallel A4+2	500V			58	-	-	-	
		600V				58	-	-	
		800V				58	-	-	
		1000				58	-	-	
		1200V				50	-	-	
		1500V				23	-	-	

Because of very high breaking point capacity, switch disconnectors "LS..." are suitable for many different operating conditions.

# PV switch disconnecter LBS DC

→ Mounting system provides better cooling

→ Handle position indicate true position of switch.

→ Due to perforated protection covers it is possible to measure contacts temperature without removing covers.



→ Indicator provides contacts position.



→ Possible to lock handle with 3 locks.



→ Package includes connection screws.



LBS DC are manually operated multipolar load break switches.  
 Making and breaking capacity under load conditions up to 1500 VDC.  
 These extremely durable switches have been tested and approved for use in the most demanding applications. They have been designed and tested for all types of applications: earthing, floating or bipolar.

- Thanks to a reduced number of bridging bars, you can limit your costs and save mounting time
- A 2 pole switch has reduced warming and can be placed in a smaller enclosure
- can be directly connected to up to four independent PV panel strings (4 pole switch)
- tested to critical currents and at 10kA short circuit during 50 ms without specific protection

High quality materials glass fibre reinforced polyester frame provide:

- high mechanical strength,
- stability to temperature variations (RTI of 130 ° C)
- high dielectric strength (high CTI / tested as per standard ASTM D 2303)

### General characteristics

Rated voltage	1500 VDC (500 VDC/pole) IEC 60947-3
Rated current	≤ 400A
Standards	IEC 60947-3, IEC 60364-7-712
Application	For interrupting DC circuits (PV, battery storage systems, etc.)

### 1 PV circuit 1000 V DC

Type	Code No.	Nr. Of poles	Description	Current [A] / pole	Weight [g]	Packaging [pcs]
LBS 100 2P DC1000	004661853	2	500 V DC / pole	100	1850	1
LBS 160 2P DC1000	004661854	2		160	1870	1
LBS 250 2P DC1000	004661855	2		250	1850	1
LBS 400 4P DC1000	004661856	4	250 V DC / pole	400	2360	1
LBS 500 4P DC1000	004661857	4		500	2404	1

Connect poles in series for 1000 VDC, or in parallel for higher nominal current (2x at 2 pole and 4x at 4 pole)

### 1 PV circuit 1500 V DC

Type	Code No.	Nr. Of poles	Description	Current [A] / pole	Weight [g]	Packaging [pcs]
LBS 275 3P DC1500	004661858	3	500 V DC / pole	275	6270	1
LBS 400 3P DC1500	004661859	3		400	6270	1

### Direct handle for direct operation LBS

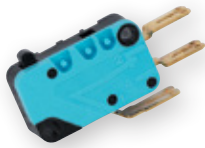
Type	Code No.	Description	For use with	Weight [g]	Packaging [pcs]
LBS-DH630/B	004661481	Direct handle black	LBS100-500DC (1000V, 1500V)	100	1/25
LBS-DH630/R	004661861	Direct handle red		100	1/80

### Door interlocked handle IP65

Type	Code No.	Description	For use with	Weight [g]	Packaging [pcs]
LBS-EH630/G...400/G FLBS	004661483	Door handle Black	LBS100-500DC (1000V, 1500V)	250	1/20
LBS-EH630/YR	004661486	Door handle Red		250	1/20

\*shaft not included





### Shaft for door interlocked handle

Type	Code No.	Description	For use with	Weight [g]	Packaging [pcs]
LBS-S200/630 (CO) .../400 FLBS	004661490	Shaft 200mm	LBS100-500DC (1000V, 1500V)	160	1/25
LBS-S320/630 (CO) .../400 FLBS	004661493	Shaft 320mm		250	1/50
LBS-S500/630 (CO) .../400 FLBS	004661496	Shaft 500mm		390	1/10

### Terminal screen

Type	Code No.	Description	For use with	Weight [g]	Packaging [pcs]
LBS-TS250 2P DC	004661862	Terminal screen, 2P	LBS ... 2P	40	1/30
LBS-TS500 4P DC	004661863	Terminal screen, 4P	LBS ... 4P	50	1/20
LBS-TS500 3P DC	004661865	Terminal screen, 3P	LBS ... 3P	60	1/100

1 reference includes 1pc for top or bottom contacts, to protect all, 2 references shall be ordered

### Bridging bars

Type	Code No.	Description	For use with	Weight [g]	Packaging [pcs]
LBS-BR500 1P DC	004661864	Bridging bars, 1pole	LBS ... DC 1000	60	1/100
LBS-BR400 1P DC	004661866		LBS ... DC 1500	210	1/50

1 reference includes connection for 1 pole

### Auxiliary contact

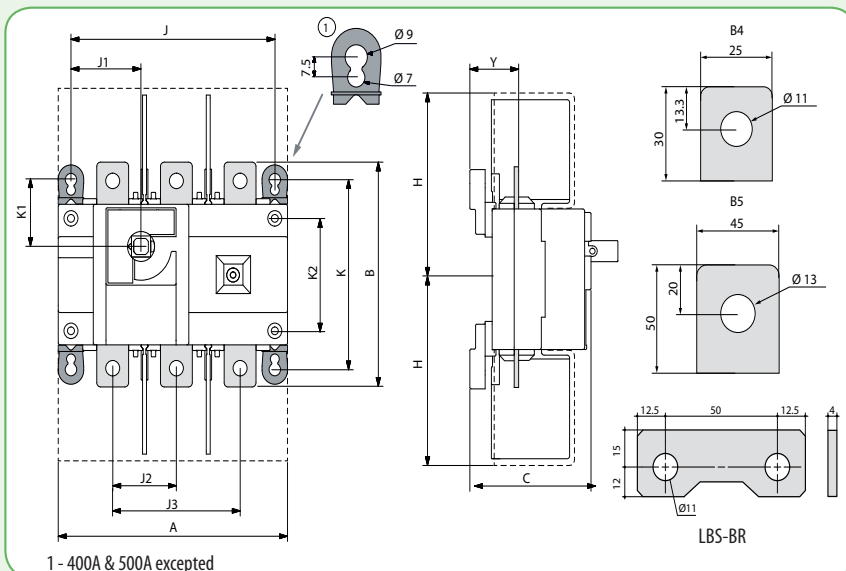
Type	Code No.	Description	For use with	Weight [g]	Packaging [pcs]
LBS-PS11	004661499	Auxiliary contact (CO)	LBS... DC1000, DC1500	26	1/30

### Technical data (according to IEC 60947-3):

Type	LBS 100 DC					LBS 160 DC				
Rated current, $I_n$	100 A					160 A				
Thermal current at 40 °C	100 A					160 A				
Thermal current at 50 °C	100 A					160 A				
Thermal current at 60 °C	100 A					160 A				
Rated insulation voltage, $U_n$	1000 V DC					1000 V DC				
Rated impulse withstand voltage, $U_{imp}$	12kV					12kV				
Number of circuits	Rated insulation voltage	Utilisation category	$I_e$ (A)	Number of poles in series per circuit	Number of poles of the device	Frame size	$I_e$ (A)	Number of poles in series per circuit	Number of poles of the device	Frame size
1	1000V DC	DC-21B	100	1P+ ; 1P-	2	B4	160	1P+ ; 1P-	2	B4
Rated short-term withstand current 0,3c (rms)		10 kA				10 kA				
Rated short-term withstand current 1c (rms)		5 kA				5 kA				
Rated short-circuit making capacity $I_{cm}$ (50ms)		10 kA				10 kA				
Max Cu rigid cable cross-section		35 mm <sup>2</sup>				70 mm <sup>2</sup>				
Max Cu busbar width		32 mm				32 mm				
Tightening torque min		20 Nm				20 Nm				
Tightening torque max		26 Nm				26 Nm				
Durability (number of operating cycles)		10000								
Operating effort		10 Nm								
Weight of a 2 pole device		1,8 kg								

**Technical data (according to IEC 60947-3):**

Type	LBS 250 DC					LBS 275 DC					
Rated current, $I_n$	250 A					275 A					
Thermal current at 40 °C	250 A					275 A					
Thermal current at 50 °C	250 A					275 A					
Thermal current at 60 °C	250 A					275 A					
Rated insulation voltage, $U_n$	1000 V DC					1500 V DC					
Rated impulse withstand voltage, $U_{imp}$	12kV					12kV					
Number of circuits	Rated insulation voltage	Utilisation category	$I_e$ , (A)	Number of poles in series per circuit	Number of poles of the device	Frame size	$I_e$ , (A)	Number of poles in series per circuit	Number of poles of the device	Frame size	
1	1000V DC	DC-21B	250	1P+; 1P-	2	B4	275	1P+; 1P-	3	B5	
1	1500V DC		-	-	-	-		2P+; 1P-	3		
Rated short-term withstand current 0,3c (rms)		10 kA					10 kA				
Rated short-term withstand current 1c (rms)		5 kA					5 kA				
Rated short-circuit making capacity $I_{cm}$ (50ms)		10 kA					10 kA				
Max Cu rigid cable cross-section		120 mm <sup>2</sup>					185 mm <sup>2</sup>				
Max Cu busbar width		32 mm					32 mm				
Tightening torque min		20 Nm					20 Nm				
Tightening torque max		26 Nm					26 Nm				
Durability (number of operating cycles)		10000									
Operating effort		10 Nm									
Weight of a 2 pole device		1,8 kg					-				
Weight of a 3 pole device		-					6 kg				

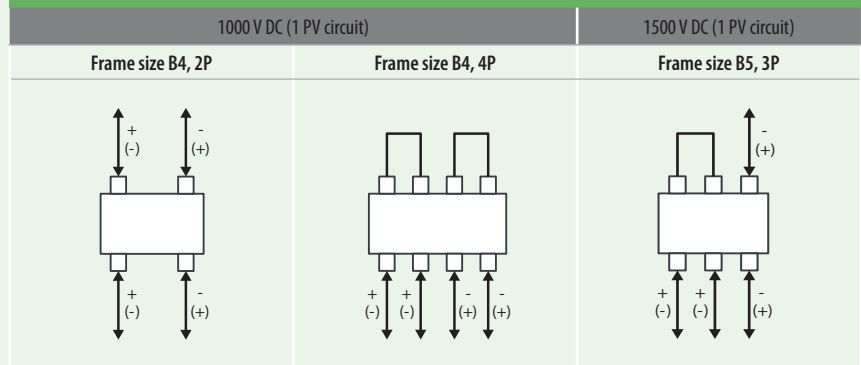


Frame size	Nr. Of poles	Dimensions (mm)											
		A	B	C	H	J	J1	J2	J3	K	K1	K2	Y
B4	2	180	160	95	132,5	160	55	-	100	135	48	80	38,5
B4	4	230	170	79	132,5	210	105	50	-	-	-	80	22,5
B5	3	230	260	126,5	203	210	75	65	-	195	67,5	80	51,5

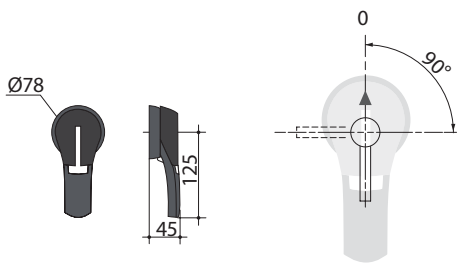
**Technical data (according to IEC 60947-3):**

Type		LBS 400 DC	LBS 500 DC								
Rated current, $I_n$		400A	500 A								
Thermal current at 40 °C		400 A	500 A								
Thermal current at 50 °C		400 A	500 A								
Thermal current at 60 °C		400 A	475 A								
Rated insulation voltage, $U_n$		1000 V DC/1500 V DC*		1000 V DC							
Rated impulse withstand voltage, $U_{mp}$		12kV		12kV							
Number of circuits	Rated insulation voltage	Utilisation category	$I_e'$ (A)	Number of poles in series per circuit	Number of poles of the device	Frame size	$I_e'$ (A)	Number of poles in series per circuit	Number of poles of the device	Frame size	
1	1000V DC	DC-21B	400	2P+ ; 2P-	4	B4	500	2P+ ; 2P-	4	B4	
	1500V DC*			2P+ ; 1P-	3	B5	-	-	-	-	
Rated short-term withstand current 0,3c (rms)				-						10 kA	
Rated short-term withstand current 1c (rms)				10 kA						5 kA	
Rated short-circuit making capacity $I_{cm}$ (50ms)				10 kA						10 kA	
Max Cu rigid cable cross-section				240 mm <sup>2</sup>						2x150 mm <sup>2</sup>	
Max Cu busbar width				32 mm						32 mm	
Tightening torque min				20 Nm						20 Nm	
Tightening torque max				26 Nm						26 Nm	
Durability (number of operating cycles)				5000							
Operating effort				10 Nm							
Weight of a 3 pole device				3,8 kg						-	
Weight of a 4 pole device				2,3 kg						3,8 kg	

\* 1500 V DC rated insulation voltage only for switch 004661859

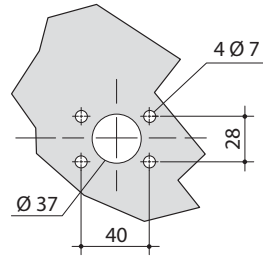
**Pole connections in series LBS DC**


Handle type LBS-EH630

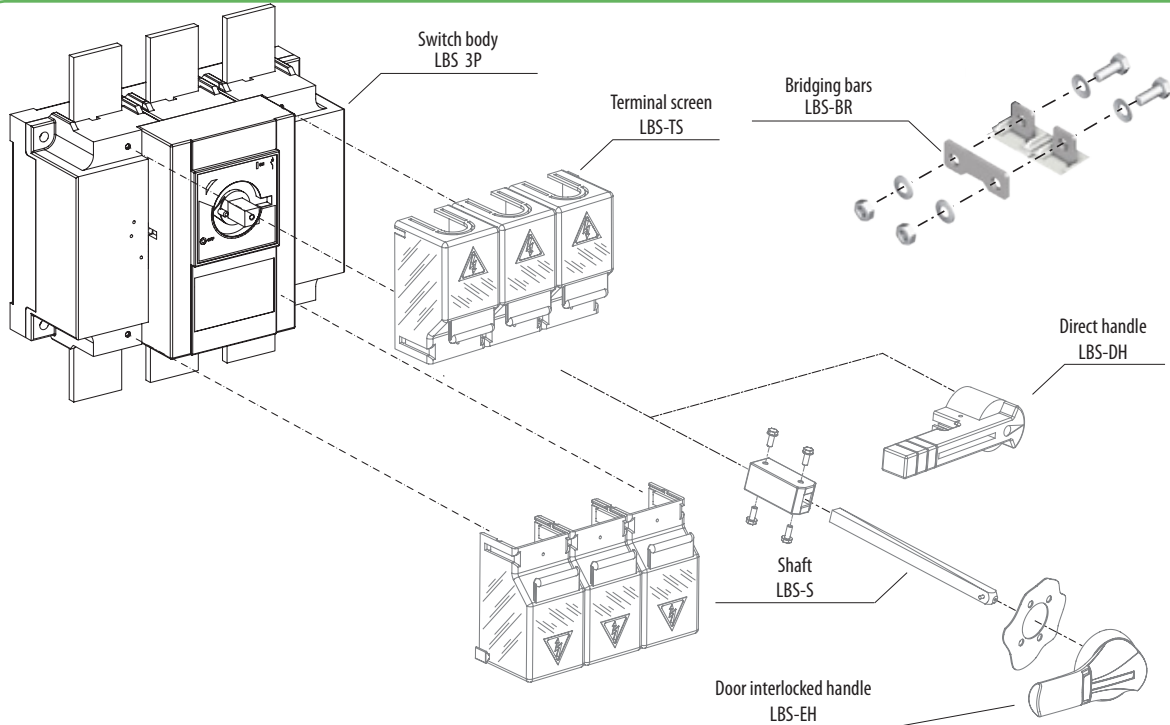
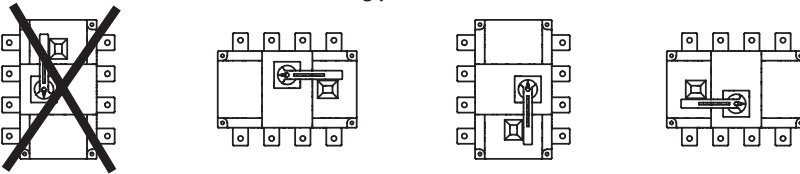


Direct front operation

Door drilling



Mounting position LBS DC





# 12 modules PV distribution boards 1,2 inputs

## General characteristics

Rated voltage	500V, 1000V d.c.
Rated current	13A, 25A d.c.
Standards	IEC 60364-7-712:2005, EN 60439-1, Type test ICEM-TC Maribor
Protection class	IP54
Category (switch)	DC 21B
Isolation class	II □
Temperature range	-25 °C to +60 °C
Application	As PV distribution board in photovoltaic power plant



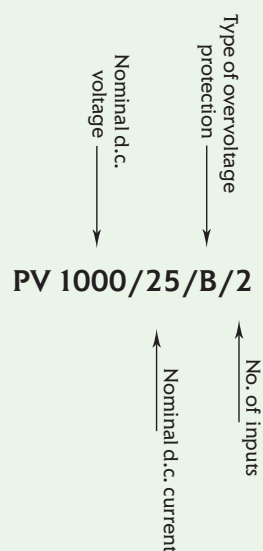
	Voltage	Overvoltage protection	Inputs	13 A d.c.		25A d.c.		Weight (g)	Pack.
12 modules (318 x 258 x 142mm)	500V d.c.	B	1	001103001	PV500/13/B/1	001103017	PV500/25/B/1	1860	1
			2	001103002	PV500/13/B/2	001103018	PV500/25/B/2	1980	
		C	1	001103005	PV500/13/C/1	001103021	PV500/25/C/1	1860	
			2	001103006	PV500/13/C/2	001103022	PV500/25/C/2	1980	
	1000V d.c.	B	1	001103009	PV1000/13/B/1	001103025	PV1000/25/B/1	1860	
			2	001103010	PV1000/13/B/2	001103026	PV1000/25/B/2	1980	
		C	1	001103013	PV1000/13/C/1	001103029	PV1000/25/C/1	1860	
			2	001103014	PV1000/13/C/2	001103030	PV1000/25/C/2	1980	

Overvoltage protection	Ground cable
Type B	16mm <sup>2</sup>
Type C	6mm <sup>2</sup>

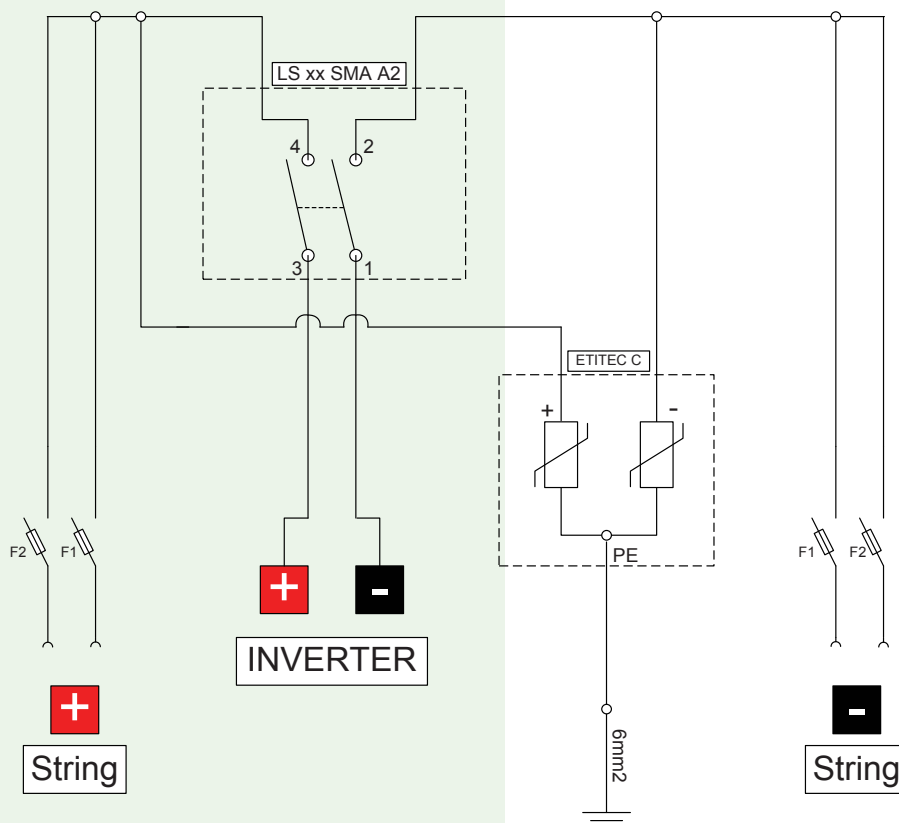
### Important!

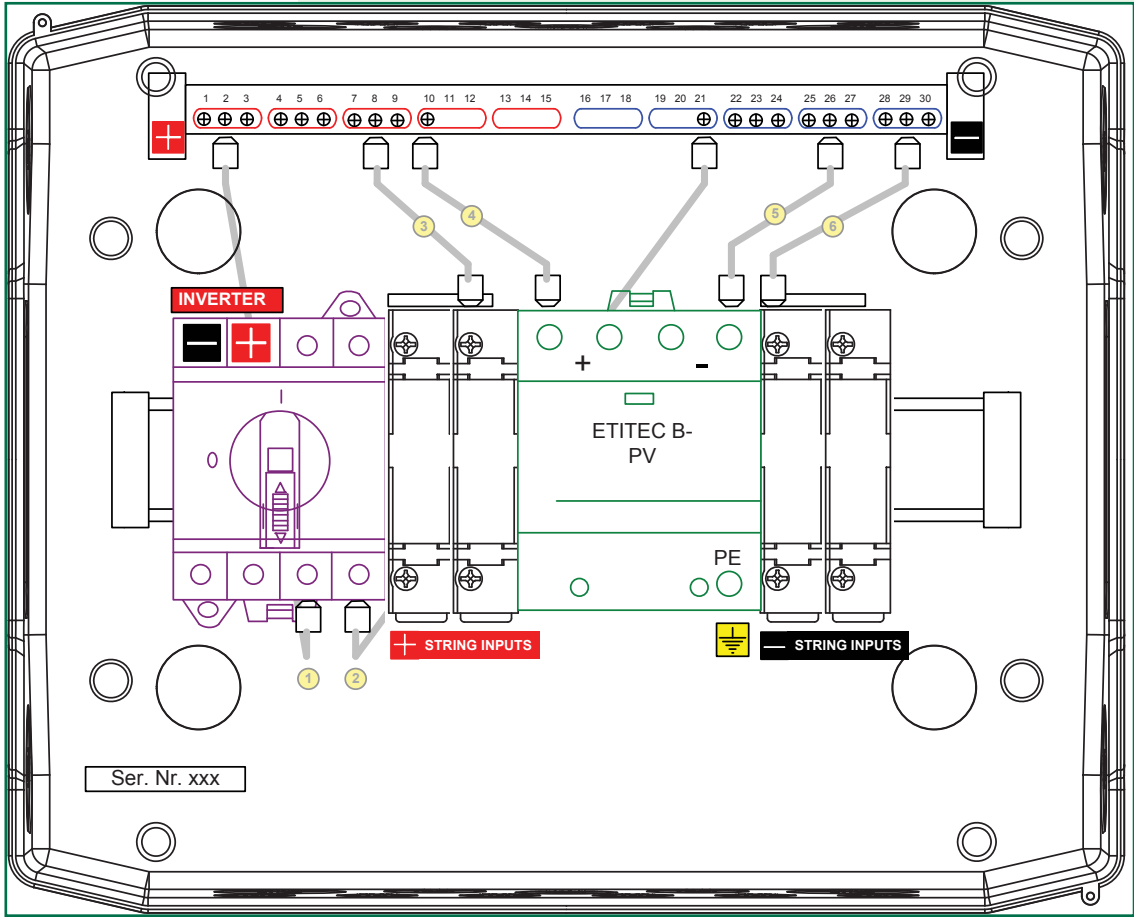
CH 10 gPV fuse-links are not included in the distribution board package and need to be ordered separately.

## Type designation:

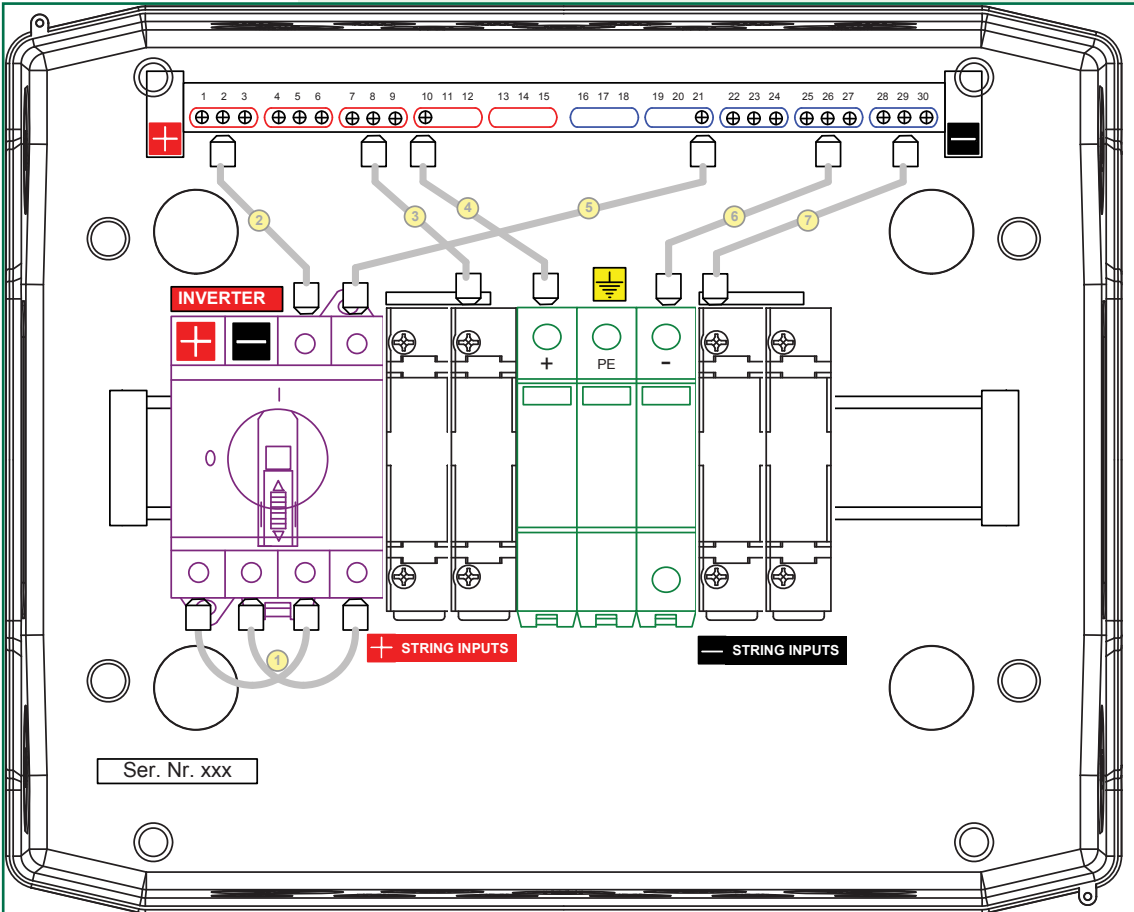


## Electric scheme:





PV500/B/25/2



PV1000/C/25/2



# 24 modules PV distribution boards (3,4,5,6 inputs)

## General characteristics

Rated voltage	500V, 1000V d.c.
Rated current	13A, 25A d.c.
Standards	IEC 60364-7-712:2005, EN 60439-1, Type test ICEM-TC Maribor
Protection class	IP54
Category (switch)	DC 21B
Isolation class	II □
Temperature range	-25 °C to +60°C
Application	As PV distribution board in photovoltaic power plant



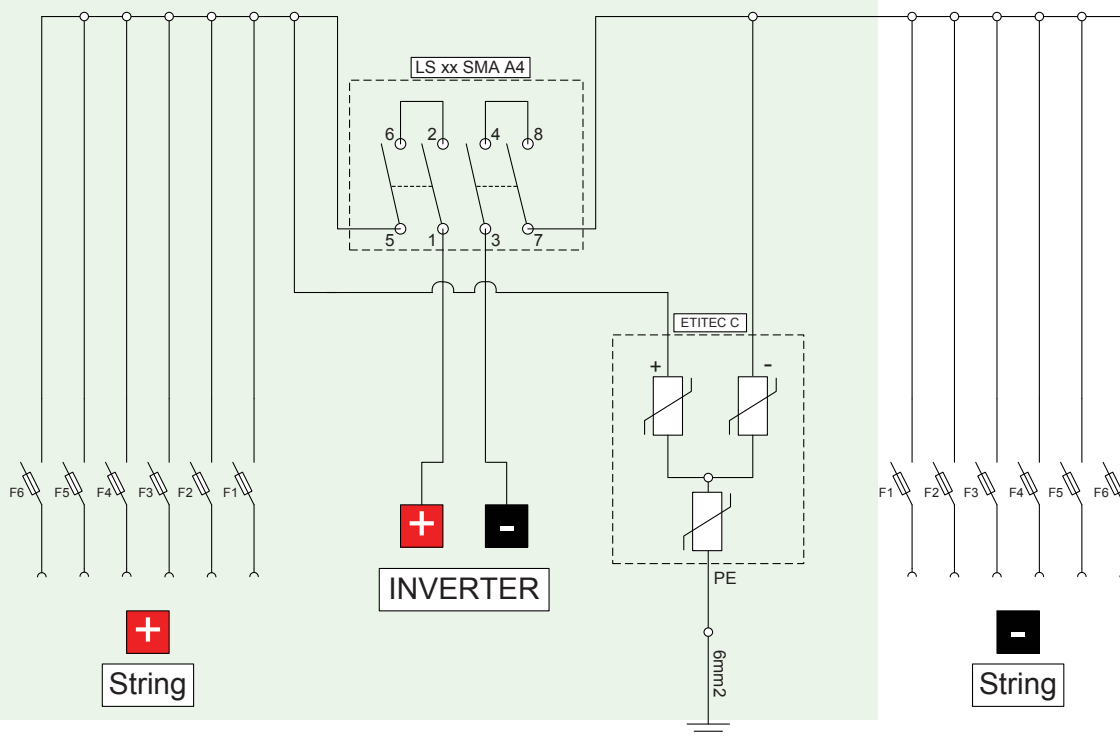
### Important!

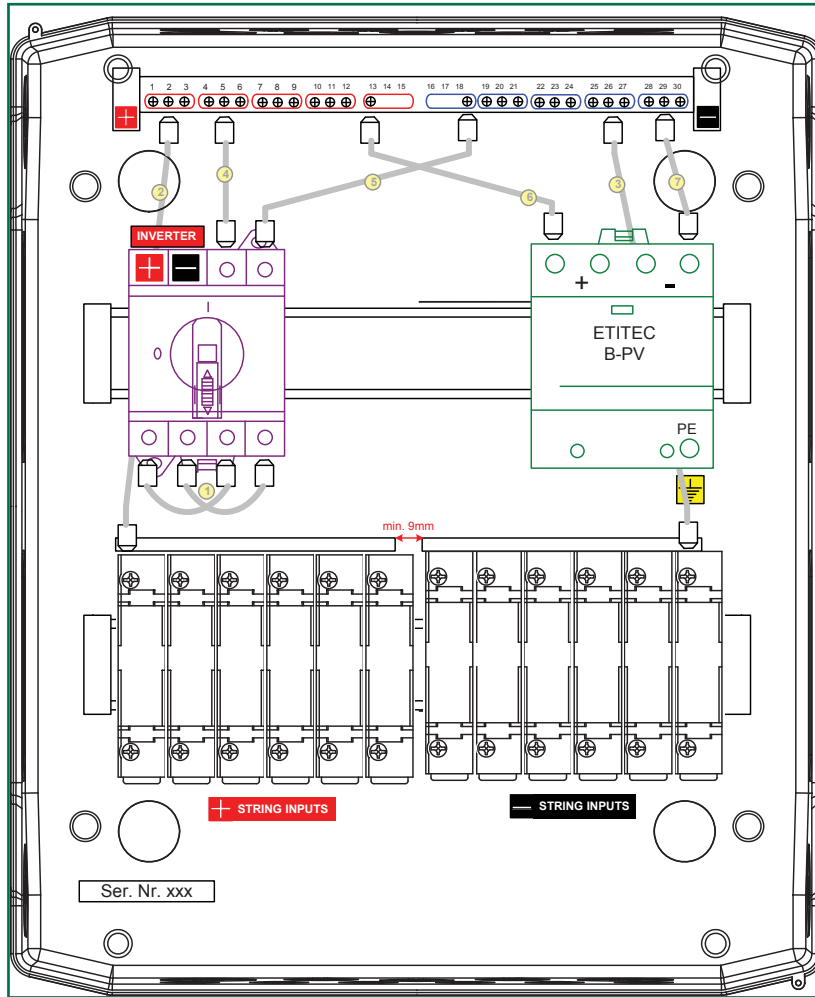
CH 10 gPV fuse-links are not included in the distribution board package and need to be ordered separately.

	Voltage	Overvoltage protection	Inputs	13 A d.c.		25A d.c.		Weight (g)	Pack.
				Code	Model	Code	Model		
24 modules (318 x 383 x 142mm)	500V d.c.	B	3	001103065	PV500/13/B/3	001103033	PV500/25/B/3	2560	1
			4	001103066	PV500/13/B/4	001103034	PV500/25/B/4	2680	
			5	001103067	PV500/13/B/5	001103035	PV500/25/B/5	2800	
		6	001103068	PV500/13/B/6	001103036	PV500/25/B/6	2920		
		C	3	001103073	PV500/13/C/3	001103041	PV500/25/C/3	2560	
			4	001103074	PV500/13/C/4	001103042	PV500/25/C/4	2680	
	5		001103075	PV500/13/C/5	001103043	PV500/25/C/5	2800		
	1000V d.c.	B	6	001103076	PV500/13/C/6	001103044	PV500/25/C/6	2920	
			3	001103081	PV1000/13/B/3	001103049	PV1000/25/B/3	2560	
			4	001103082	PV1000/13/B/4	001103050	PV1000/25/B/4	2680	
			5	001103083	PV1000/13/B/5	001103051	PV1000/25/B/5	2800	
		C	6	001103084	PV1000/13/B/6	001103052	PV1000/25/B/6	2920	
			3	001103089	PV1000/13/C/3	001103057	PV1000/25/C/3	2560	
			4	001103090	PV1000/13/C/4	001103058	PV1000/25/C/4	2680	
5			001103091	PV1000/13/C/5	001103059	PV1000/25/C/5	2800		
			6	001103092	PV1000/13/C/6	001103060	PV1000/25/C/6	2920	

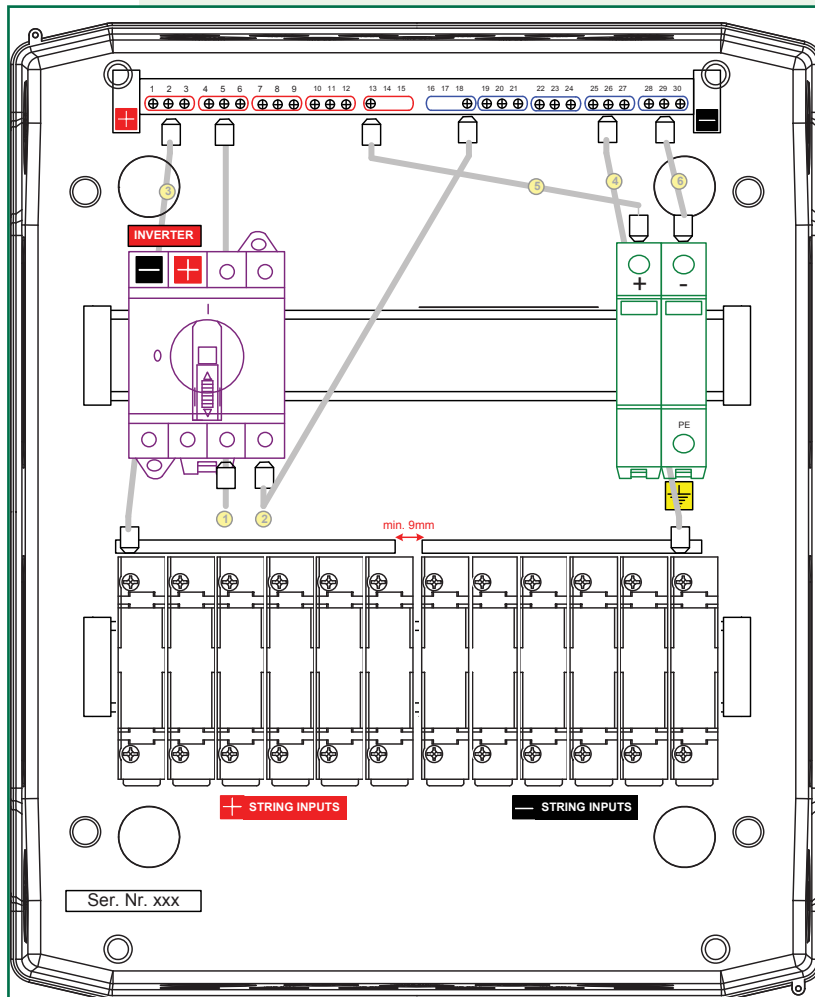
## Electric scheme:

Overvoltage protection	Ground cable
Type B	16mm <sup>2</sup>
Type C	6mm <sup>2</sup>





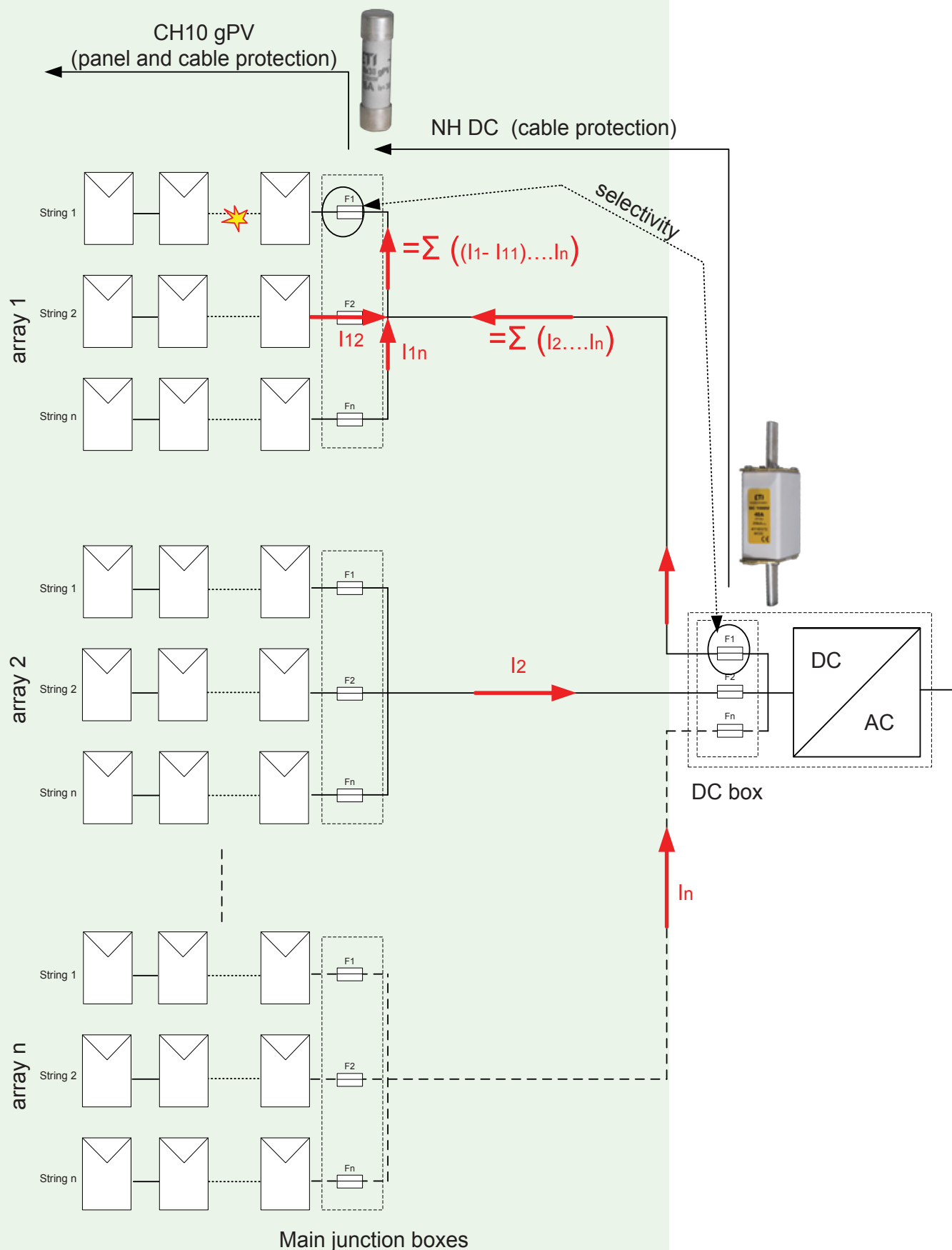
PV1000/B/25/6



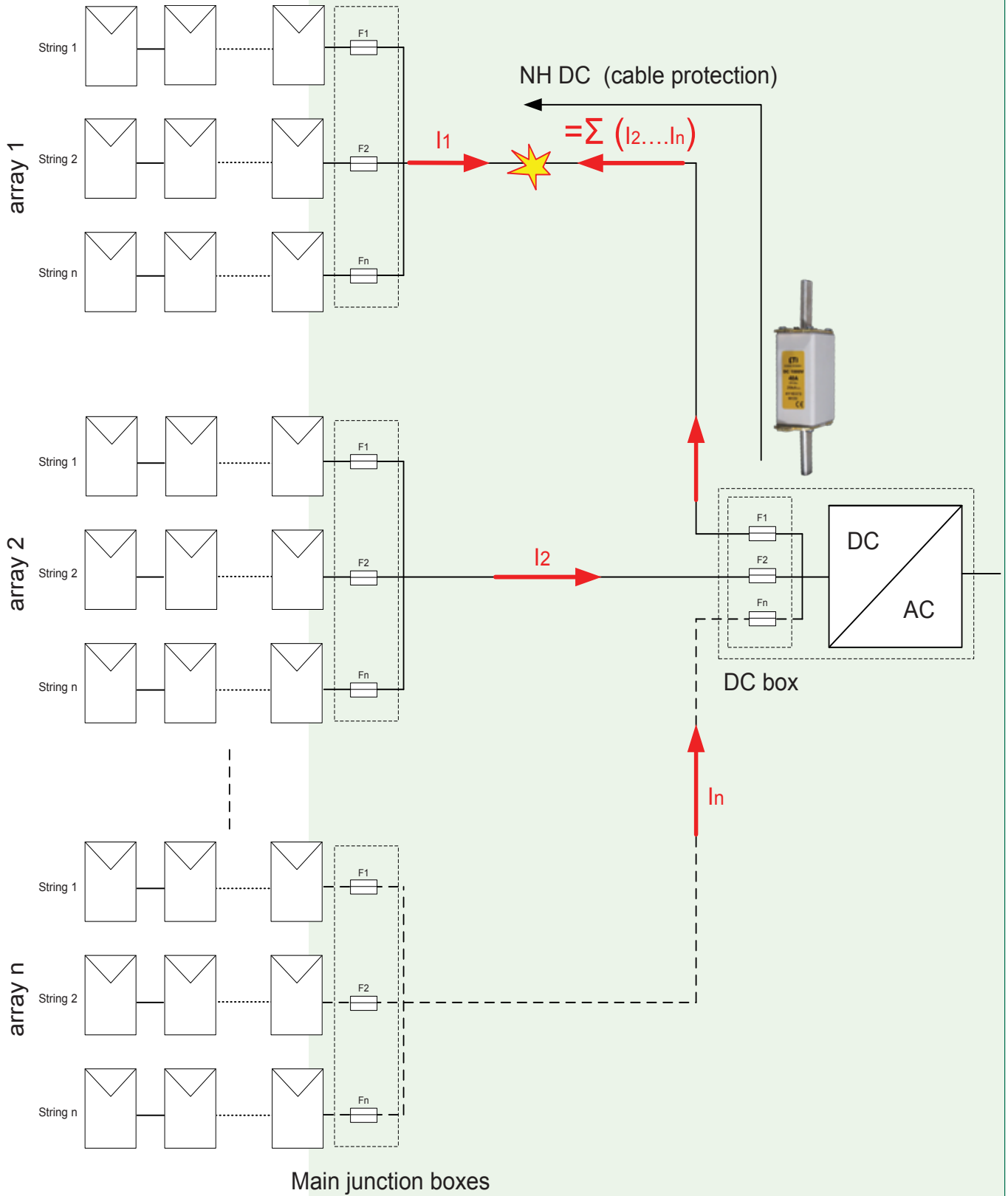
PV500/C/25/6

# Enclosures

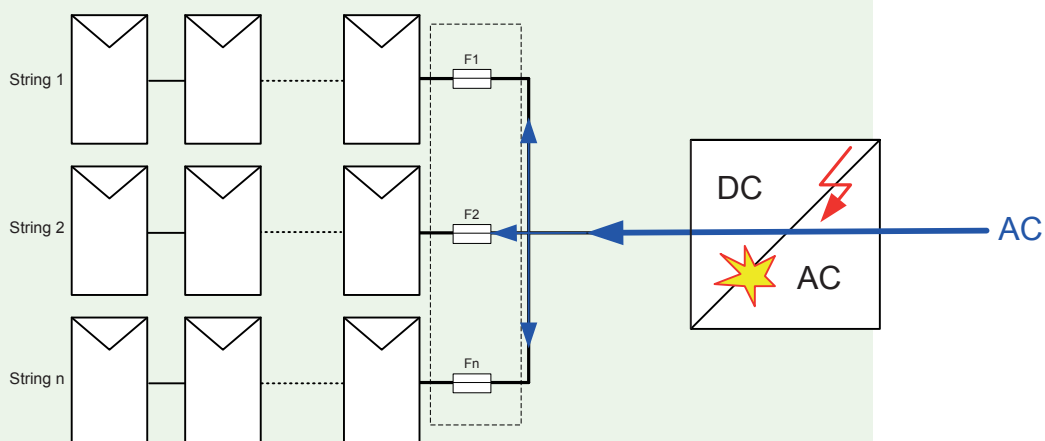
## Protection of PV modules on REVERSE current by CH gPV fuse link



# Protection of the wiring between ARRAYS from short-circuit



## Protection from »AC REVERSE current« (transformerless inverter)





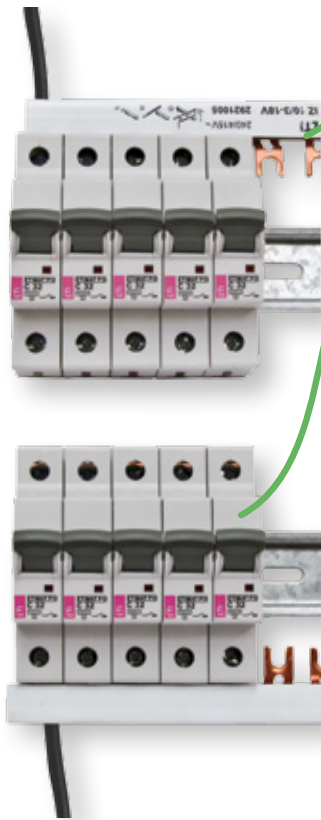
## AC - distribution and protection components

This part of the catalogue is only for informational purposes. All required commercial and technical information on the following products is available in our **General catalogue Building, Industry and Energy** and in leaflet **Special purpose fuses**.



# ASTI - Miniature circuit breakers and residual current devices

## High breaking capacity MCB ETIMAT P10



→ Supply possibility:

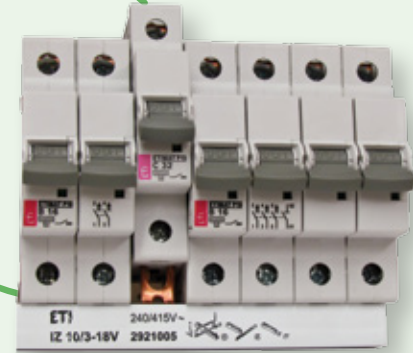
- top
- bottom



→ New method of mounting on the DIN rail and simple replacement

→ Double connection possibility

→ Every product is marked with EAN Code



→ Terminal cover



→ "ON/OFF" mark on the switch button

→ Sealing possibility in ON and OFF position

→ Locking device



→ Indication of contacts' state



→ Better protection of terminals against touching the parts under voltage

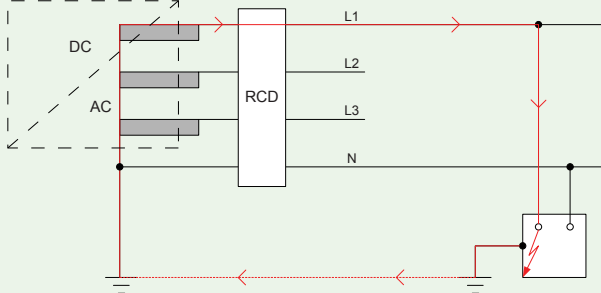


## Residual current circuit breakers RCCBs EFI type B, B+

### Application:

For PV power plant IEC 60364-4-41:2005 (Protection against electrical shock) and IEC 60364-7-712:2002 (Requirements for solar photovoltaic (PV) power supply systems) standards are used. EFI is used as protection against FIRE and as protection against indirect touch of live parts

### Disconnecting by EFI in case of fault in TT grid:



EFI type A can be used in DC/AC inverters with transformers or in DC/AC inverters for which the producer excludes the possibility of DC leakage currents on AC side.

EFI 4 (4M)		Type B			Type B+		
		Inst.	K	S	Inst.	K	S
	For alternating residual current	✓	✓	✓	✓	✓	✓
	For alternating and pulsating direct residual current	✓	✓	✓	✓	✓	✓
	For alternating, pulsating direct and smooth DC residual current (up to 1kHz)	✓	✓	✓	✓	✓	✓
	For alternating, pulsating direct and smooth DC residual current (up to 20kHz)				✓	✓	✓
	Short-circuit capacity with back-up fuse	✓	✓	✓	✓	✓	✓
	Lower temperature limit of application -25°C	✓	✓	✓	✓	✓	✓
	VDE 0664, part 1 (up to 80 A)	✓		✓	✓		✓
	Short time delayed (10 - 40 ms)		✓			✓	
	Selective (time delayed 40 -150 ms)			✓			✓



### APPLICATION

- Fault protection (protection against indirect contact of live parts)
- Additional protection (protection in case of direct contact of live parts,  $I_{\Delta n} \leq 30\text{mA}$ )
- Fire Protection (for locations exposed to fire hazard)

### Residual current sensitivity – UNIVERSAL

AC pure sinus residual current, 50/60Hz

A sinus and pulsating direct current, 50/60Hz

**B AC + A + smooth direct current + high frequency (1 kHz)**

**B+ AC + A + smooth direct current + high frequency (20kHz)**

### Basic types

#### according to rated values:

4p B  $I_n = 25\text{A}, 40\text{A}, 63\text{A}, I_{\Delta n} = 30\text{mA}, 100\text{mA}, 300\text{mA}$

4p B+  $I_n = 25\text{A}, 40\text{A}, 63\text{A}, I_{\Delta n} = 30\text{mA}, 100\text{mA}, 300\text{mA}$

#### according to breaking times:

4p B, B+ instantaneous, short time delayed, selective

#### according to the number of poles:

4p, 2p

### Standards

IEC/EN 61008-1

basic standard for RCCB's AC and A type

IEC/EN 62423

additional requirements for type B

VDE 0664-400 B+

VDE standard for B+ requirements (20kHz)



**Mode of operation**

Pure a.c. and pulsating d.c. type residual current sensitivity, A voltage independent  
 Smooth d.c. current sensitivity: B, B+ voltage dependent  
 Minimum operating voltage: 50V

**Typical applications**

Which are vulnerable to smooth d.c. residual currents:

- Frequency converters,
- Photovoltaic systems, a.c side,
- Charging stations for electric vehicles,
- Variable speed machine tools,
- UPS, computer data centres
- Elevator controls,
- Cranes of all kinds
- Electronic equipment on construction sites,
- Test set-ups in laboratories,
- Installation in general where we can expect d.c. smooth direct residual currents, etc.

## EVE - Modular devices



Utility grid monitoring relays HRN-54 and HRN-54N serves to monitor voltage, phase failure and phase sequence and perform anti-islanding protection together with ETI multifunction time relays CRM-91H and CRM-93H.

- HRN-54
- HRN-54N
- CRM-91H
- CRM-93H

**Application:**

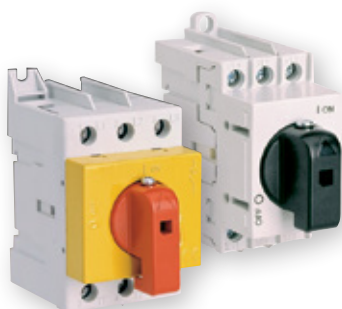
Anti-islanding protection for photovoltaic systems.



Build-in switch is used as a main switch in distribution boxes in houses or as a switch for individual electric circuits. With a build-in switch we can completely replace the cam switch. Build-in switch can be sealed either in ON or OFF position.

Available in 1-, 2-, 3- and 4-pole versions.

## ETISWITCH - Switch disconnectors



ETISWITCH Switch disconnectors series LAS and built-in switches series SV serves as control switches, load break switches and disconnecting devices in AC distribution/protection cabinets.

- LAS16 up to LAS125 (3,4-pole, from 16 to 125A)
- SV1100 up to SV4100 (1, 2, 3, and 4-pole; 100A)

# ETICON - motor contactors and ETIBREAK - MCCBs

ETICON power contactors are used as separation device actuated on anti-islanding protection signal between photovoltaic inverter and AC utility grid. For the same purpose ETIBREAK moulded case circuit breakers series EB2 assembled with motor operators enabling remote controlled operations can be used. EB2R moulded case circuit breakers with integrated residual current protection provides combined protection against overloads, short-circuits and residual currents.

- CEM 9 up to CEM300 (AC3 9 up to 300A)
- ETIBREAK EB2 (from 20 up to 630A)
- ETIBREAK EB2R (from 20 up to 250A)



## Low voltage moulded case circuit breakers with residual current protection EB2R

Breaking capacities as on MCCBs



Adjustable residual current tripping thresholds between 30mA and 3A. Adjustable time delay for residual current protection between 60ms and 700ms including INST (instantaneous) and NT (No Trip).



Voltage Presence LED Indicator and Trip Indicator (the yellow button pops up to indicate tripping due to residual current)



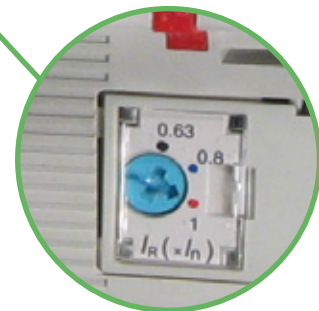
Type A: Tripping is ensured for residual sinusoidal AC in the presence of residual pulsating DC.



Test Button (to test the residual current detection and tripping system)



Dielectric test device plug (to allow dielectric testing with the EB2R closed - ON)



Adjustable overload protection  $I_R$  can be set between 63% and 100% of  $I_n$

## ETITEC - surge arresters



ETITEC surge arresters protect photovoltaic system AC components against direct and indirect lightning discharges and utility grid operating overvoltages.

- ETITEC class T1+T2: ETITEC B, B-F and ETITEC WENT
- ETITEC class T2: ETITEC C

## NV/NH - low voltage knife blade fuses and disconnectors



ETI offers a new generation of low-voltage fuse-links from size NV00C up to NV3 with new, dual indication of fuse-link operation, called KOMBI. The indicator is easily visible on the top and centre of the fuse-link, whether it is situated in a standard fuse base or vertical fuse rail or in fuse-switch disconnector.

Fuse links with gG characteristic with rated voltages 400 V a.c., 500 V a.c., 690 V a.c. and 1000 V a.c are available in versions with and without striker pin, with rated current from 2 A to 1600 A, depending on the selected product.

We also offer:

- NV fuse-rails sizes 00, 1, 2, 3 with accessories
- NV disconnectors with fuses sizes 00, 1, 2, 3, 4a.

ETI can also design and produce special non-standard fuse-links on customers' request.



# KVR - Free-standing cable distribution cabinets

Application:

- DC collector (connecting the DC cabling for PV inverters)
- AC collector (connecting the AC cabling for PV inverters)
- AC cabinets
- DC cabinets



DC collector

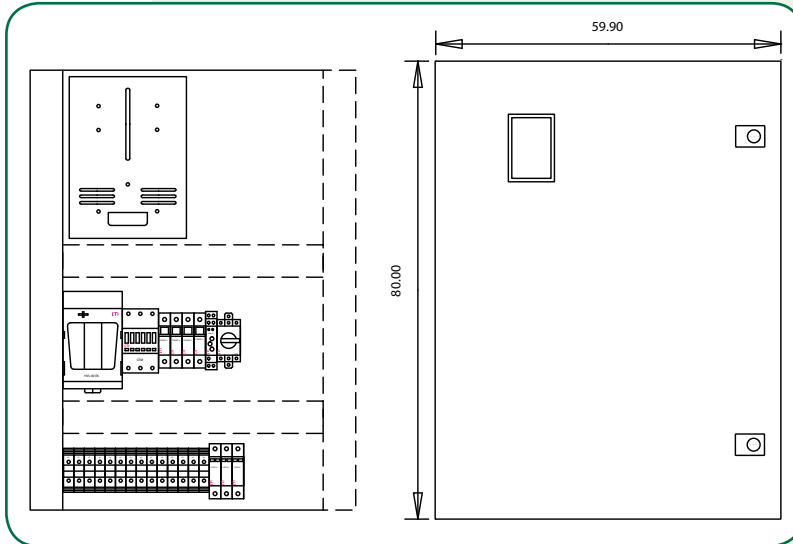
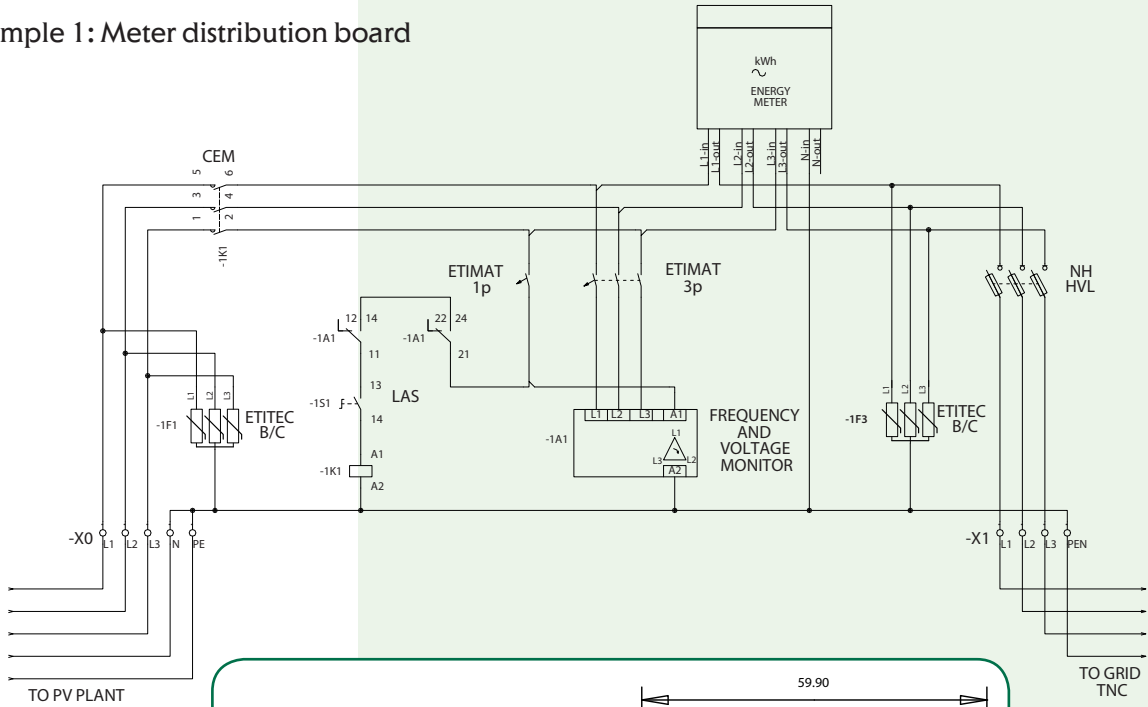


AC collector



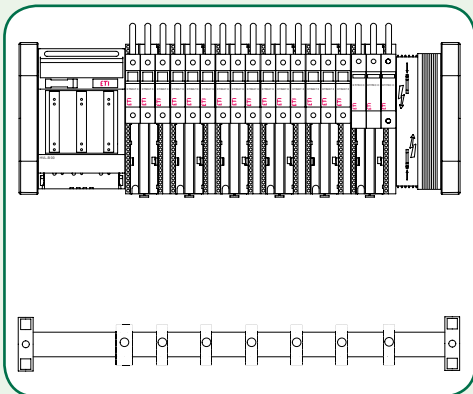
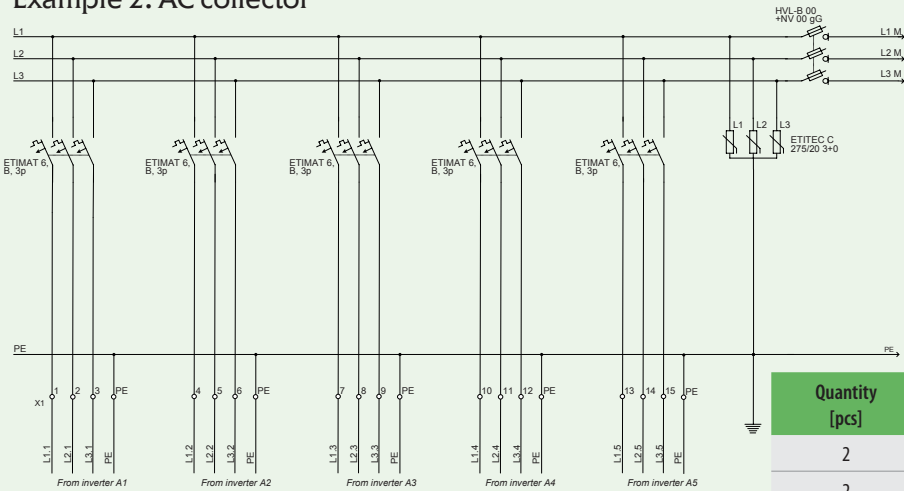
# Solutions

Example 1: Meter distribution board



Quantity [pcs]	Code No.	Description
1	001102133	GT 80-60-25
1	002440141	ETITEC B-F 320/12,5 F 3+0
1	004648103	ETICON CEM 50.00 230V
1	002115512	ETIMAT 6, B, 6A, 3P
1	002115512	ETIMAT 6, B, 6A, 1P
1	001701250	HVL EK 00, 3p
3	004181213	NH 00 C KOMBI 80 A, gG 500 V
1	004660011	ETISWITCH LAS 1
2	002911001	35 mm TH rail NVS35/7,5 1m
1	001117002	3F, VPO
1	002471416	HRN-54
10	003901157	VS 35 PA
2	003901539	VS 35 PE
2	003901158	VS 35 PAN
6	003901000	VS 2,5 PA
3	003901911	IKP S 6060

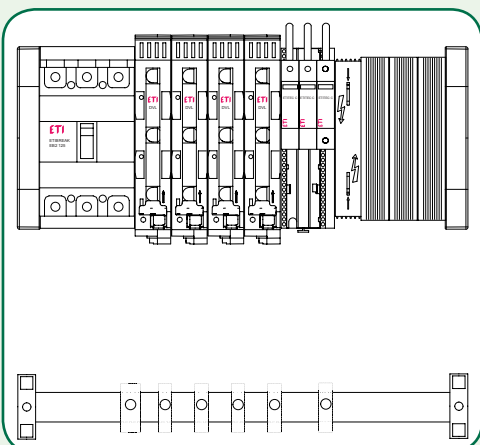
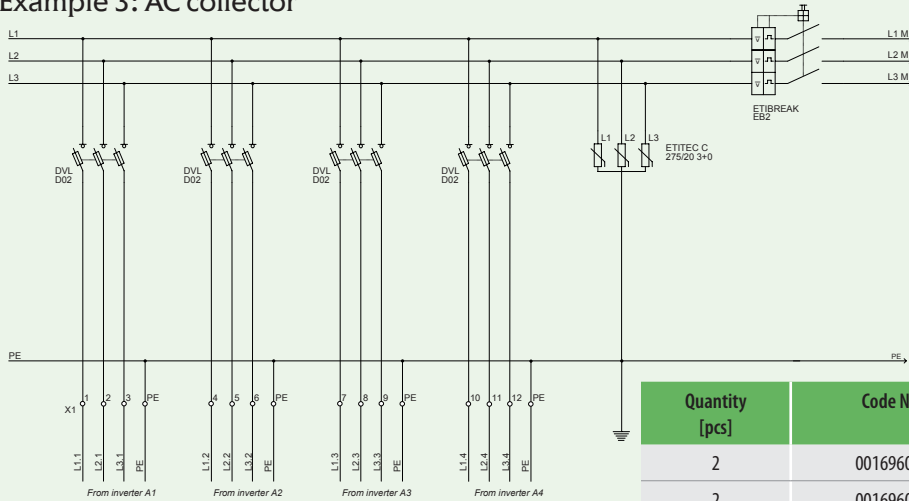
### Example 2: AC collector



Quantity [pcs]	Code No.	Description
2	001696001	BBS-60/3
2	001696006	L-BBS-60/3
1	001696009	BBC-60/3
6	001696083	DA-60/32/72/1
1	001696042	HVL-B 00 3p M8
5	002111516	ETIMAT 6, B, 3p
1	002441522	ETITEC C 275/20 3+0
3	004183214	NH 00, 100A, gG
2	001696000	BBS-60/1
6	001696019	CT-5/16
1	001696021	CT-5/50

\* see general catalogue about 60mm busbar system

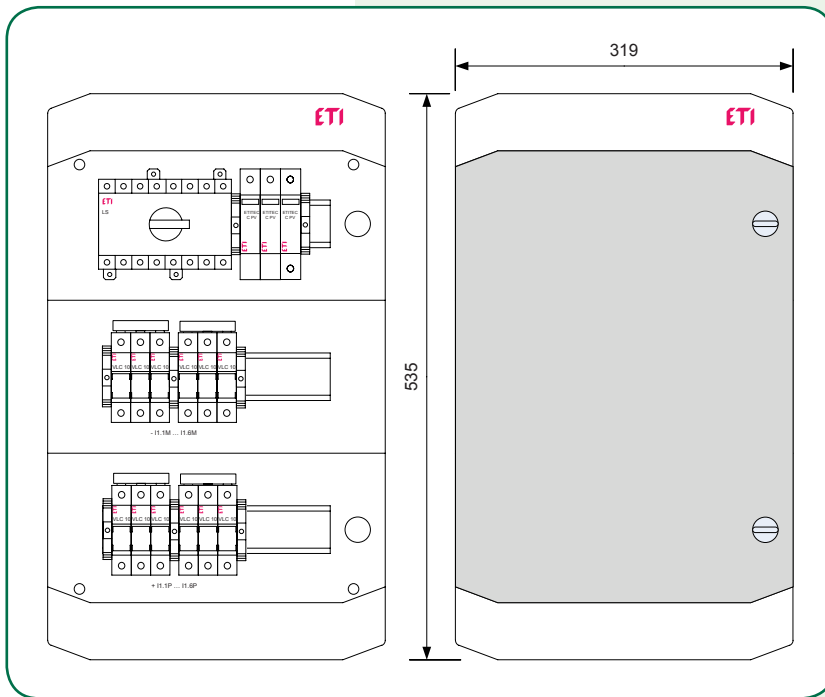
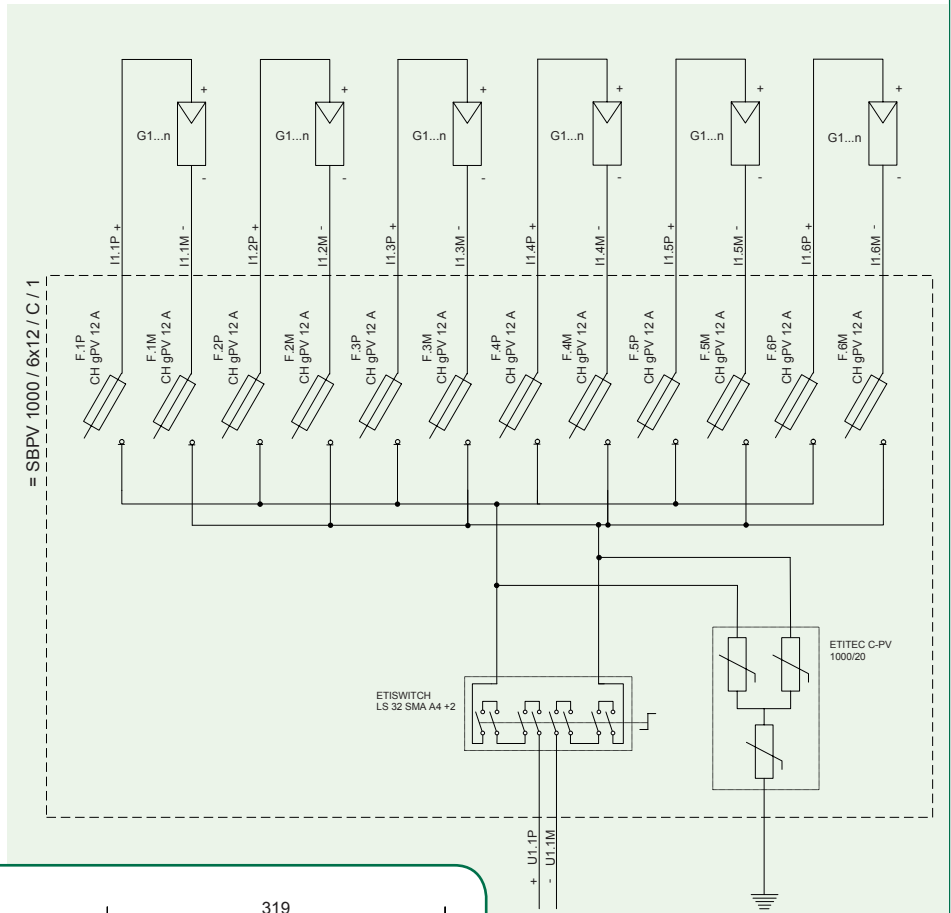
### Example 3: AC collector



Quantity [pcs]	Code No.	Description
2	001696001	BBS-60/3
2	001696006	L-BBS-60/3
3	001696009	BBC-60/3
1	001696083	DA-60/32/72/1
4	001696050	DVL-60/183
12	002212006	D02, 32A
1	002441522	ETITEC C 275/20 3+0
1		universal MCCB adapter, frame 125
1	004671046	ETIBREAK EB2 125/3S 125A 3p
2	001696000	BBS-60/1
5	001696019	CT-5/16
1	001696021	CT-5/50

\* see general catalogue about 60mm busbar system

Example 4: DC junction box

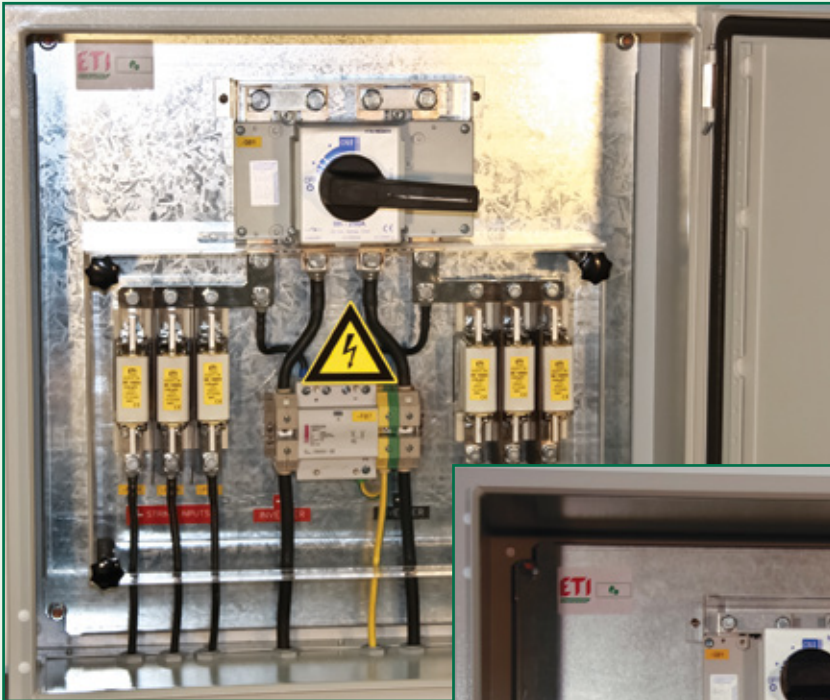


Quantity [pcs]	Code No.	Description
1	001101064	ECH-36PT
12	002540201	EFH 10 1p DC 1000V
0,25	002921101	IZS10/1F/54
12	002625106	CH10 gPV 1000V 12A
1	002445208	ETITEC C-PV 1000/20
1	004660066	LS32 SMA A4+2
8	003901016	PKPA 35 end bracket

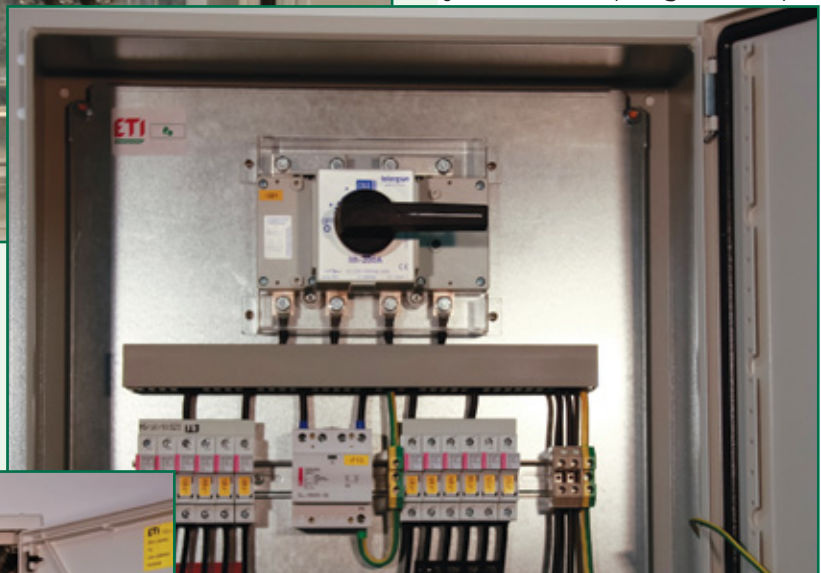


# Design on customer's request

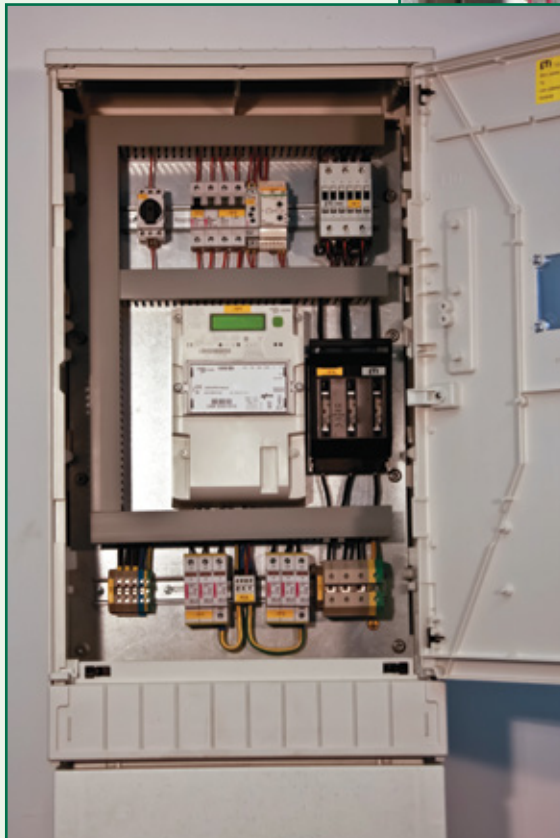
DC junction box (NH gPV fuses)



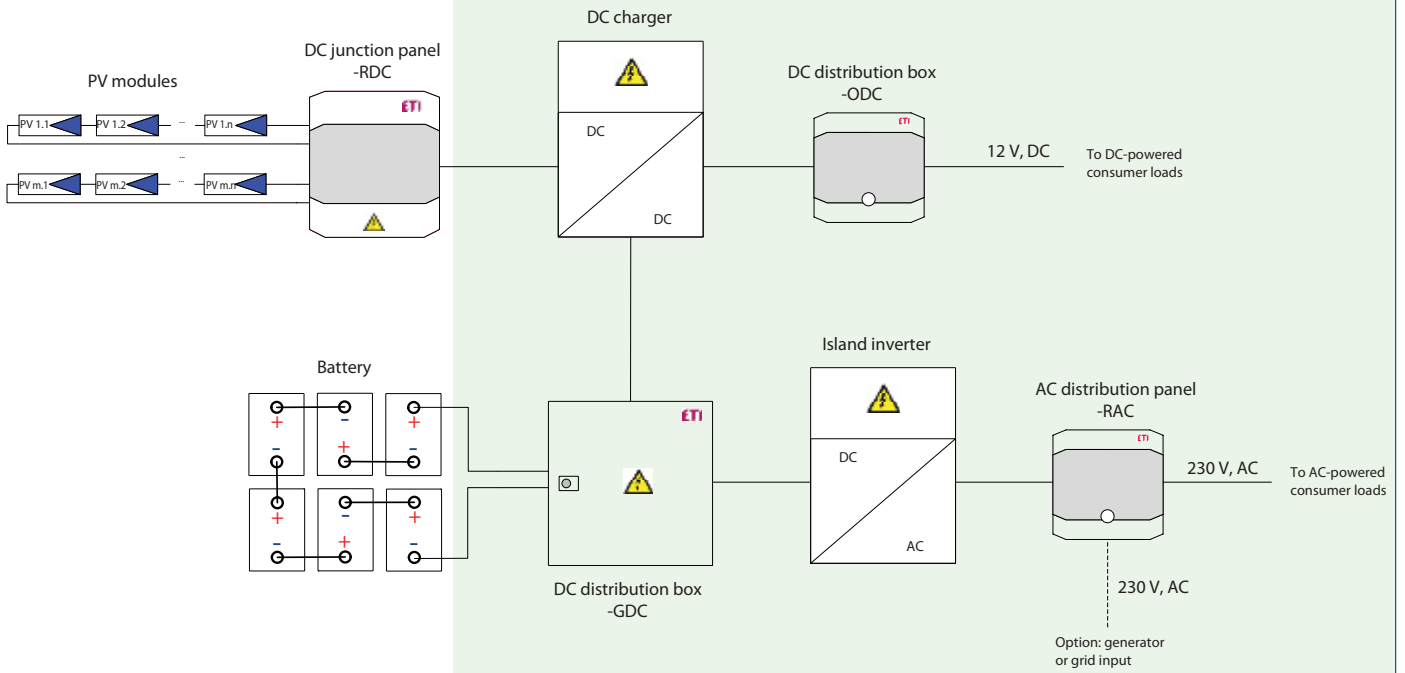
DC junction box (CH gPV fuses)



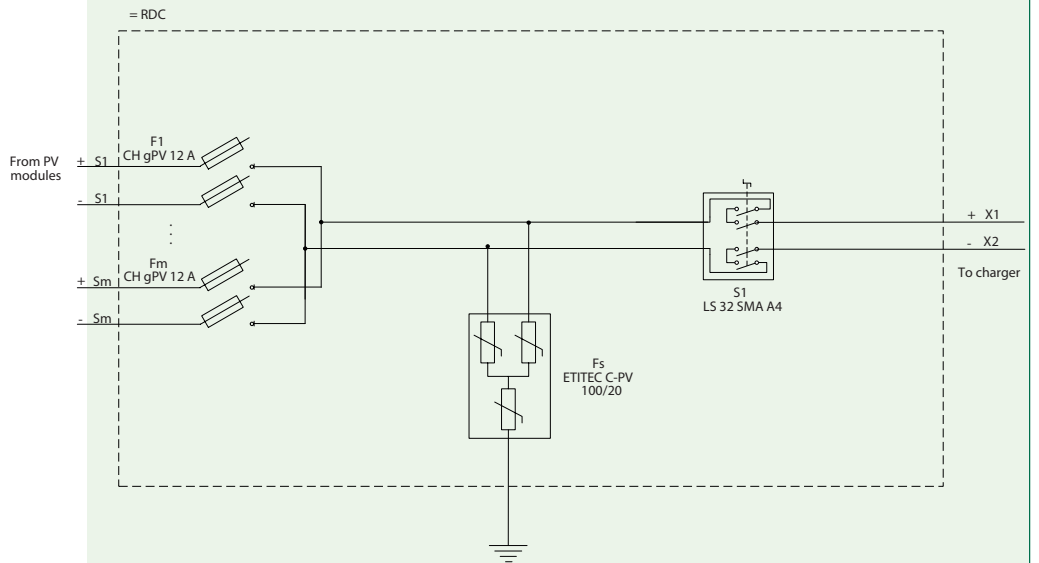
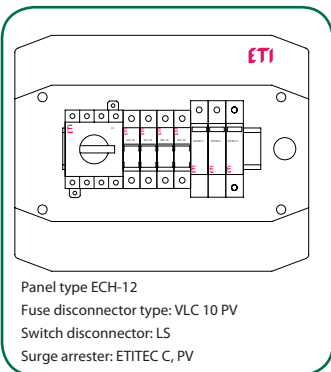
Meter distribution cabinet



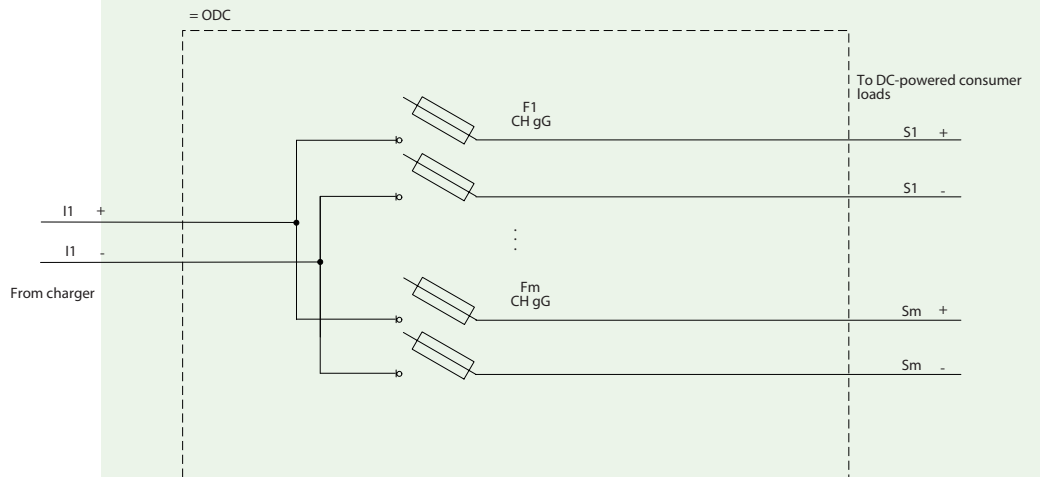
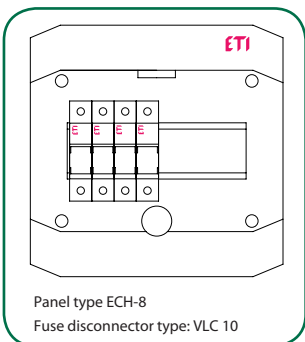
## PV off-grid system protection



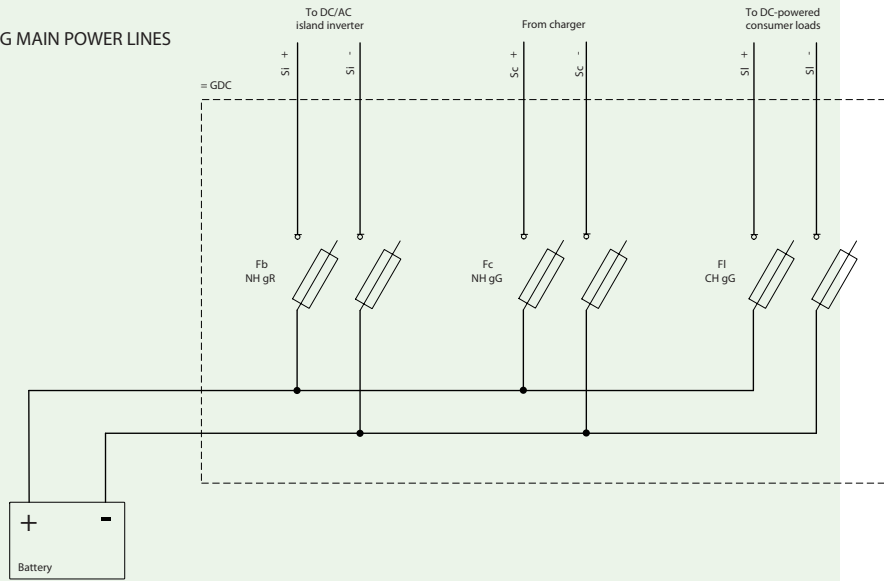
### PROTECTING DC SIDE OF ISLAND PV PLANT.



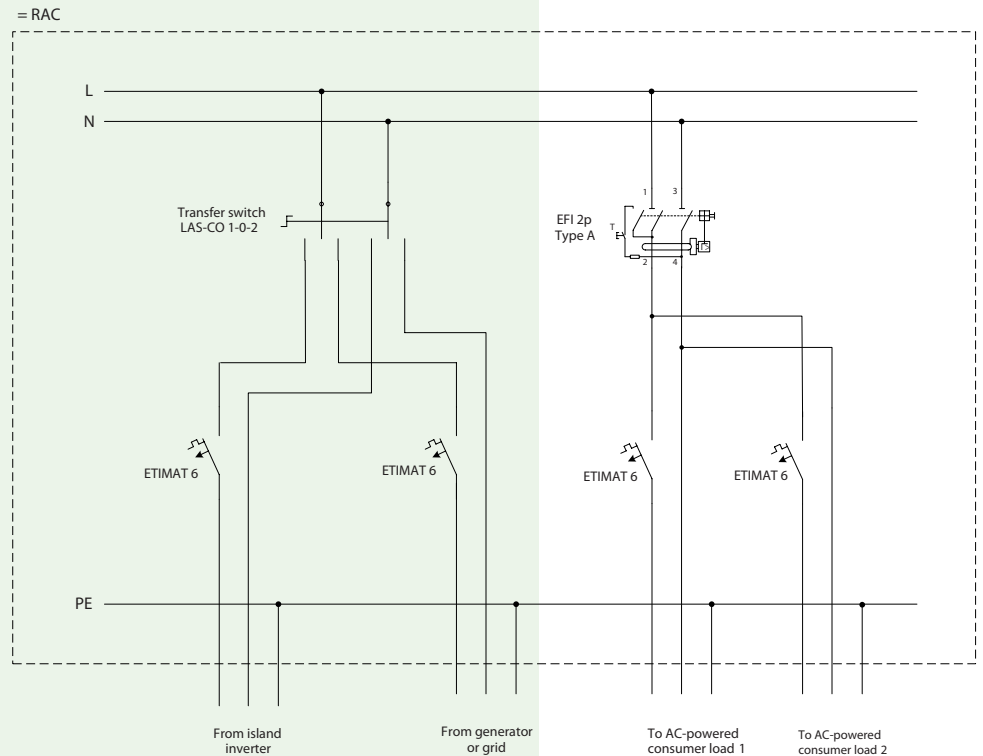
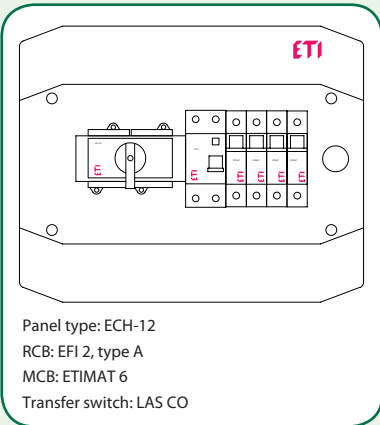
### PROTECTING DC-POWERED CONSUMER LOADS DIRECTLY FROM CHARGES.



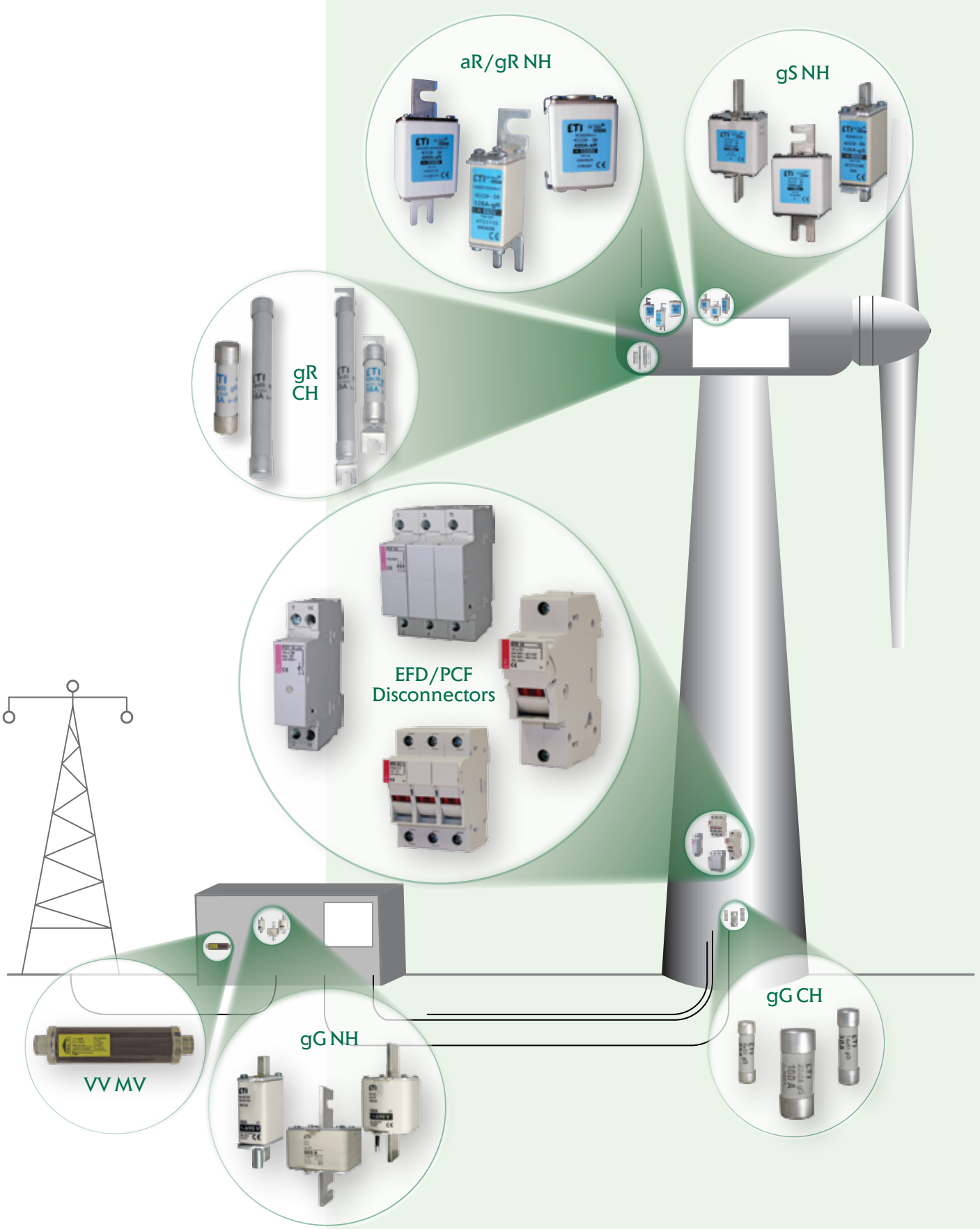
PROTECTING MAIN POWER LINES



AC DISTRIBUTION BOX



# Overcurrent Protection for Wind Power Generation



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## 0049

004941112	50
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## 0067

006710335	20
006710335	23
006710340	20
006710340	23
006710341	20
006710341	23







