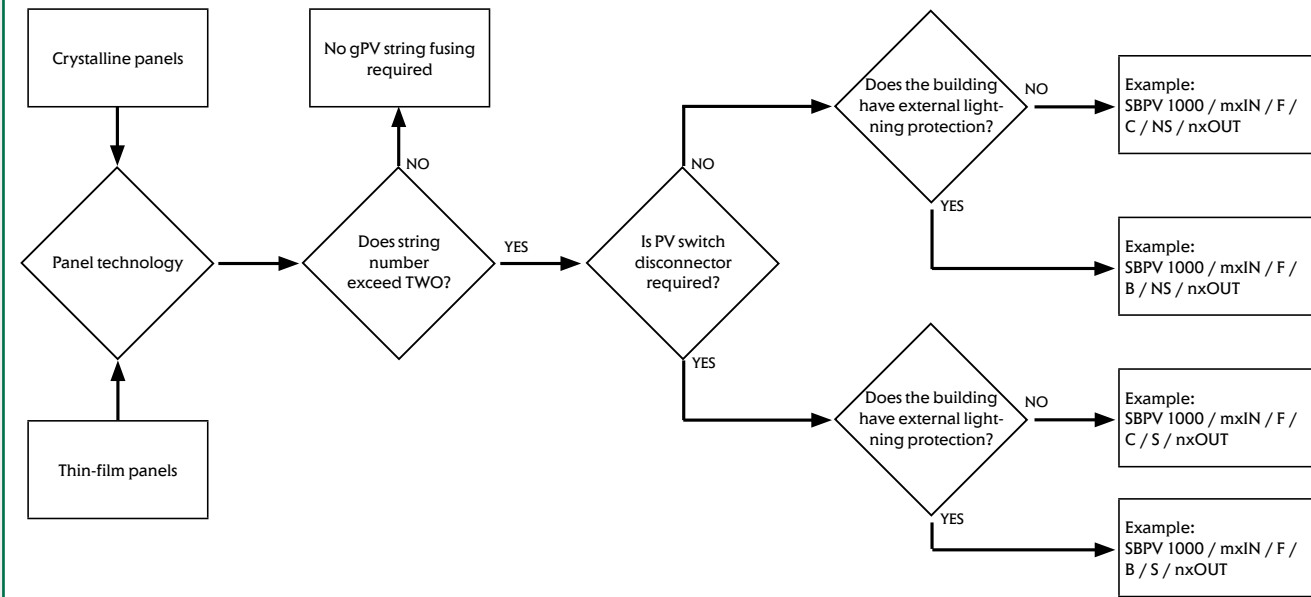


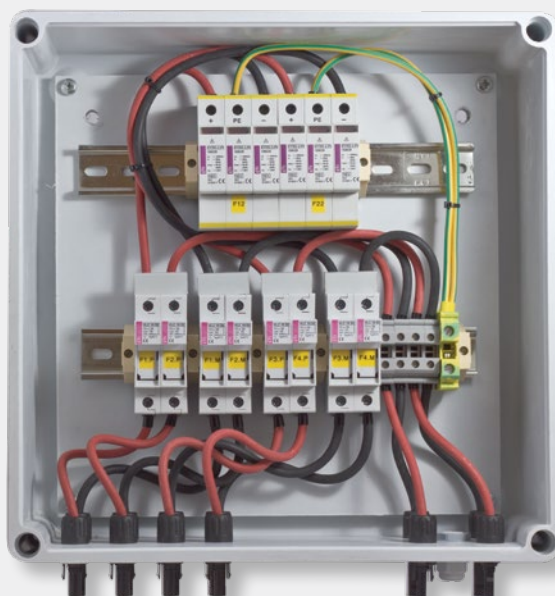
Ready made DC-junction boxes

For more technical, ordering and other information, please see our catalogue [Solutions](#)

How to choose correct protection for PV junction boxes

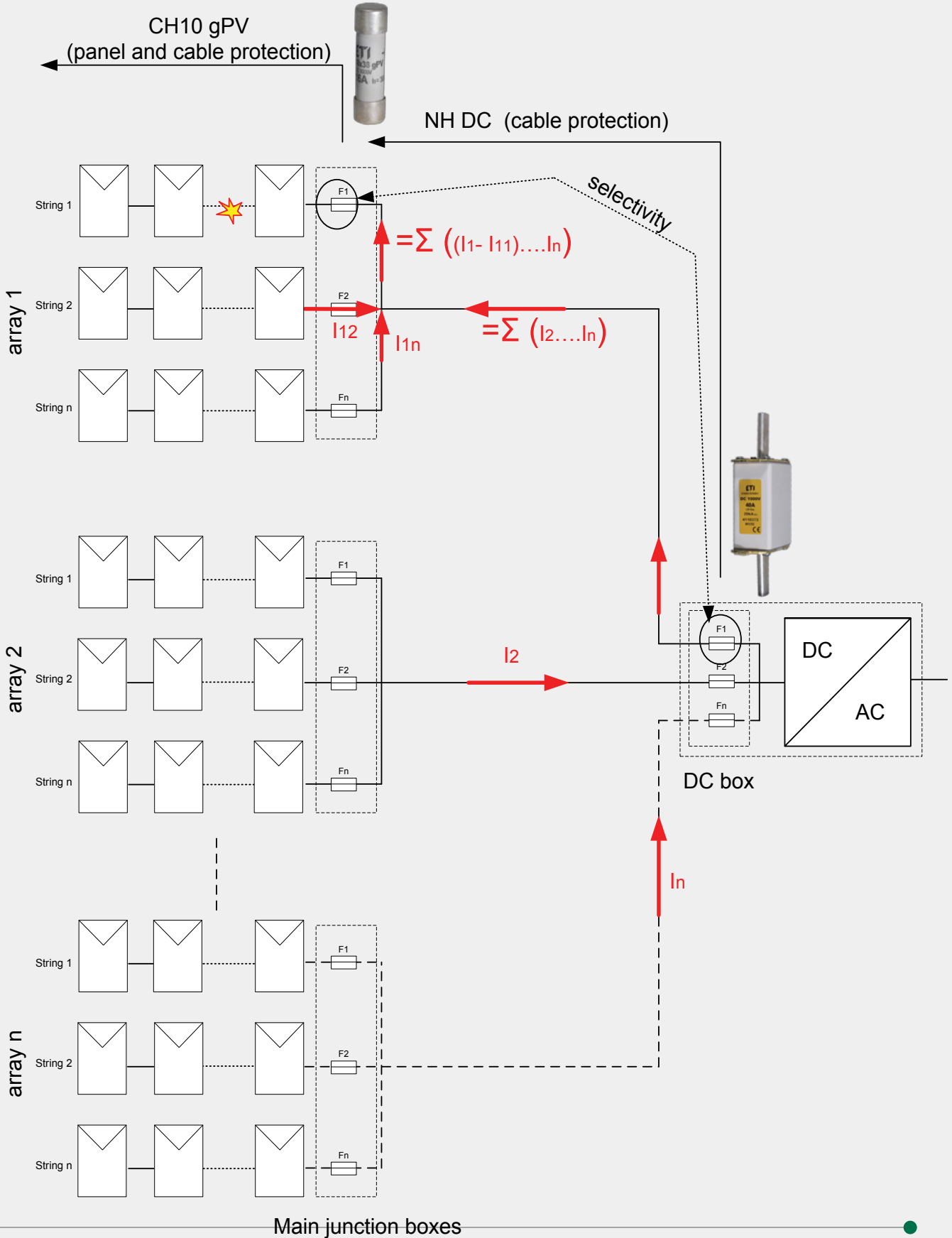


Green protect - gPV



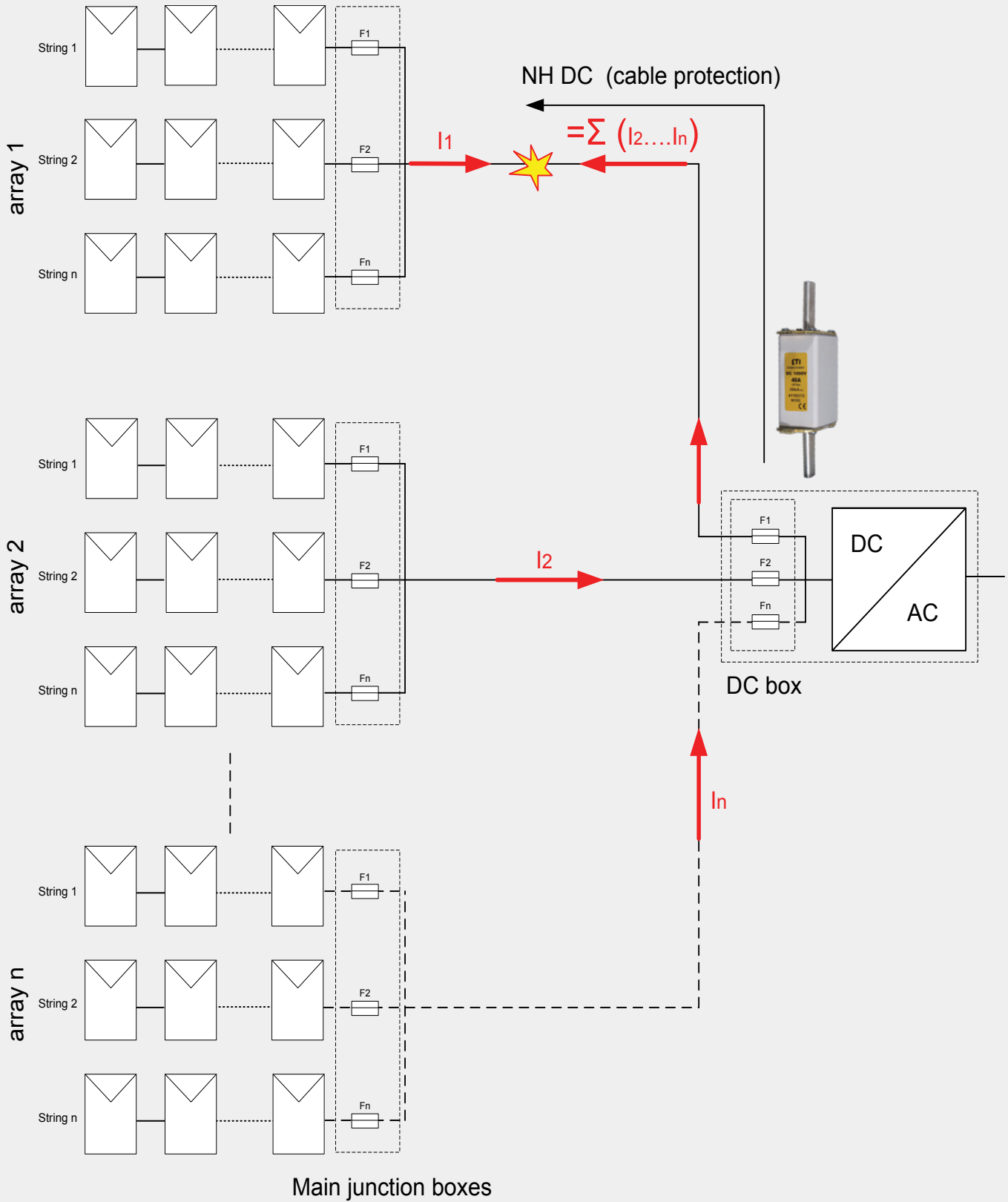
Enclosures

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

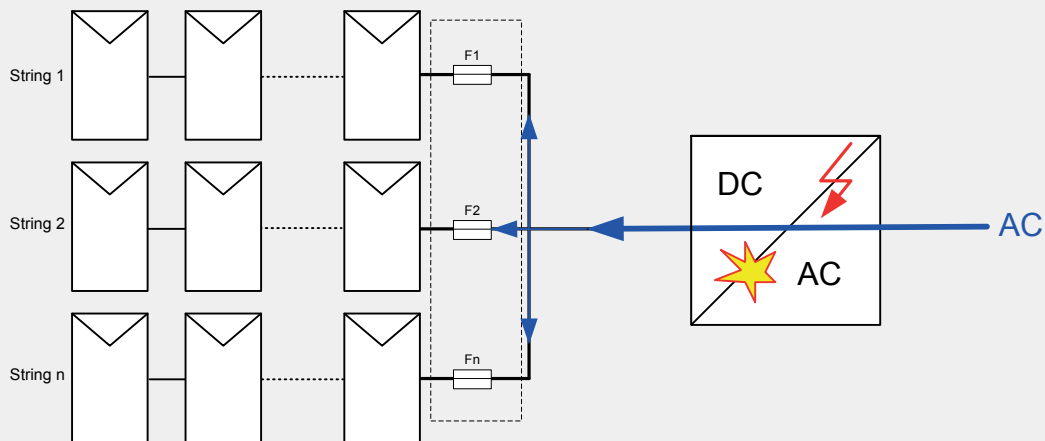


Green protect - gPV

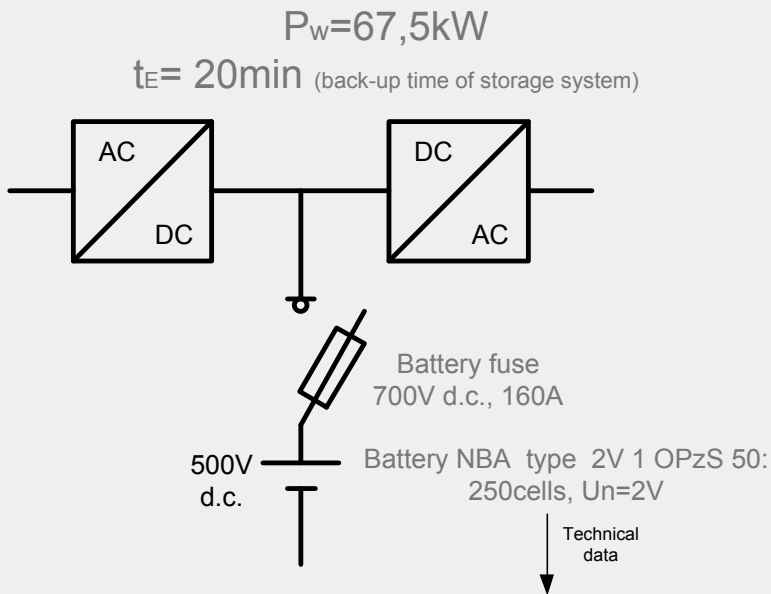
Protection of the wiring between ARRAYS from short-circuit



Protection from »AC REVERSE current« (transformerless inverter)



How to choose the correct Battery fuse - example



1. Short circuit point (I_k):

2. Types, capacities, dimensions, mass

Type	C10	C5	C3	C1	Ri 1)	I_k 2)	length	width	height max	mass 3)	mass 4)
	Ah	Ah	Ah	Ah	mΩ	kA	mm	mm	mm	kg	kg
Ue (V/cell)	1,80	1,77	1,75	1,67							
2V 1 OPzS 50	50	45	36	24	3,96	0,58	103	206	426	4,5	7
2V 2 OPzS 100	100	85	69	48	1,98	1,16	103	206	426	7,5	6,5
2V 3 OPzS 150	150	125	102	72	1,27	1,74	103	206	426	10	6
2V 4 OPzS 200	200	170	138	96	1,01	2,06	103	206	426	12	6
2V 5 OPzS 250	250	210	171	120	0,81	2,57	124	206	426	14	7,5
2V 6 OPzS 300	300	250	204	144	0,69	3,14	145	206	426	16	9
6V 3 OPzS 150	150	125	107	75	3,71	0,62	233	224	426	23,5	13,5

1, 2) internal resistance and short - circuit - current according to IEC 896-1

3) dry-charged 4) filled and charged



$I_k = 580 \text{ A}$

2. Operating point (t_E/I_B):

$t_E = 20 \text{ min}$ (1200s)

$U_E = 250 \text{ cells} \times 1,8 \text{ V} = 450 \text{ V d.c.}$

$I_B = P_w / U_E = 67,5 \text{ kW} / 450 \text{ V} = 150 \text{ A}$

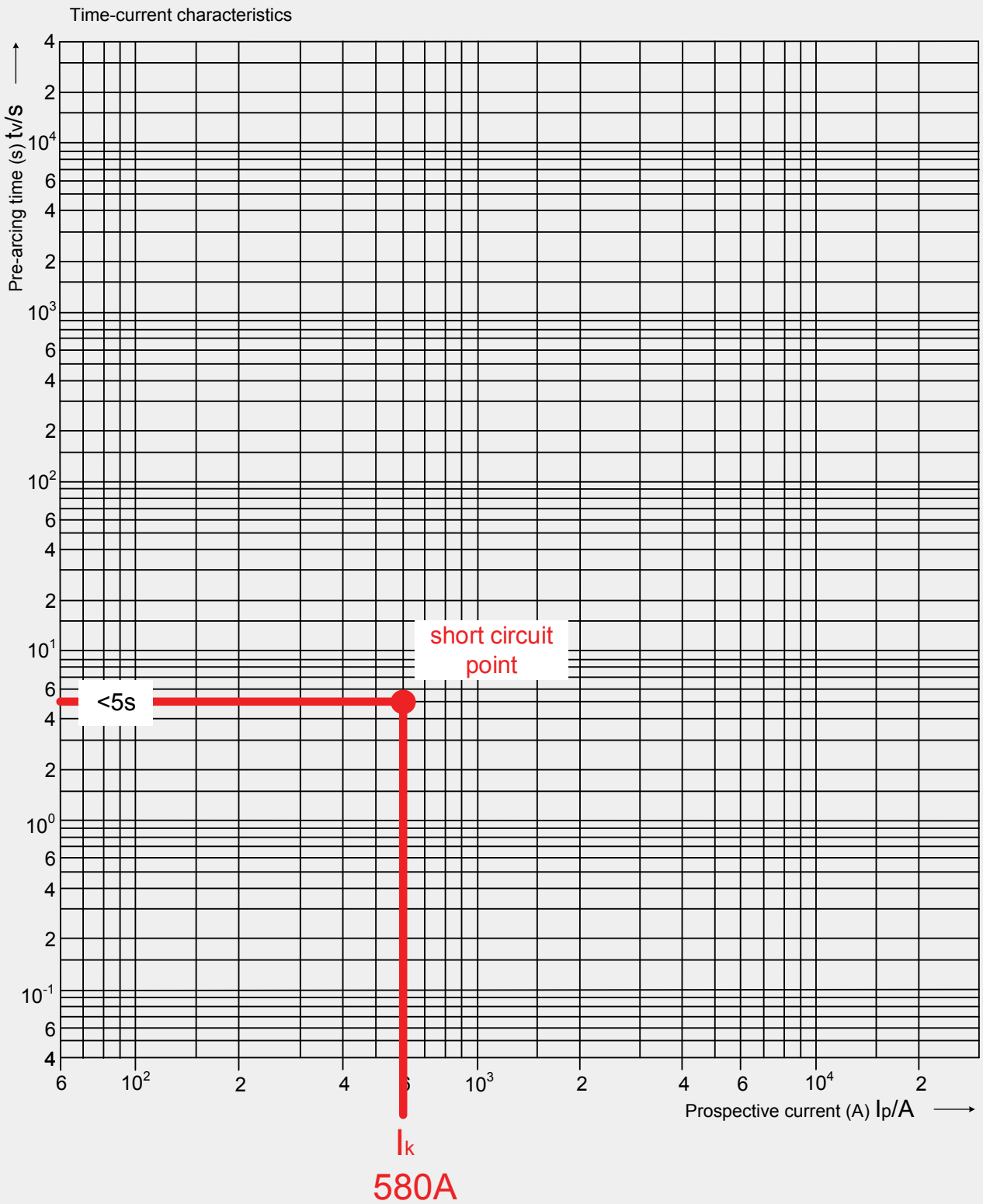
3. DC rated fuse link:

Battery fuse 700V d.c., L/R=10ms

NH00 gG 160A 690V a.c.....problem DC rating at min. breaking capacity $\sim 2 \times I_n$???

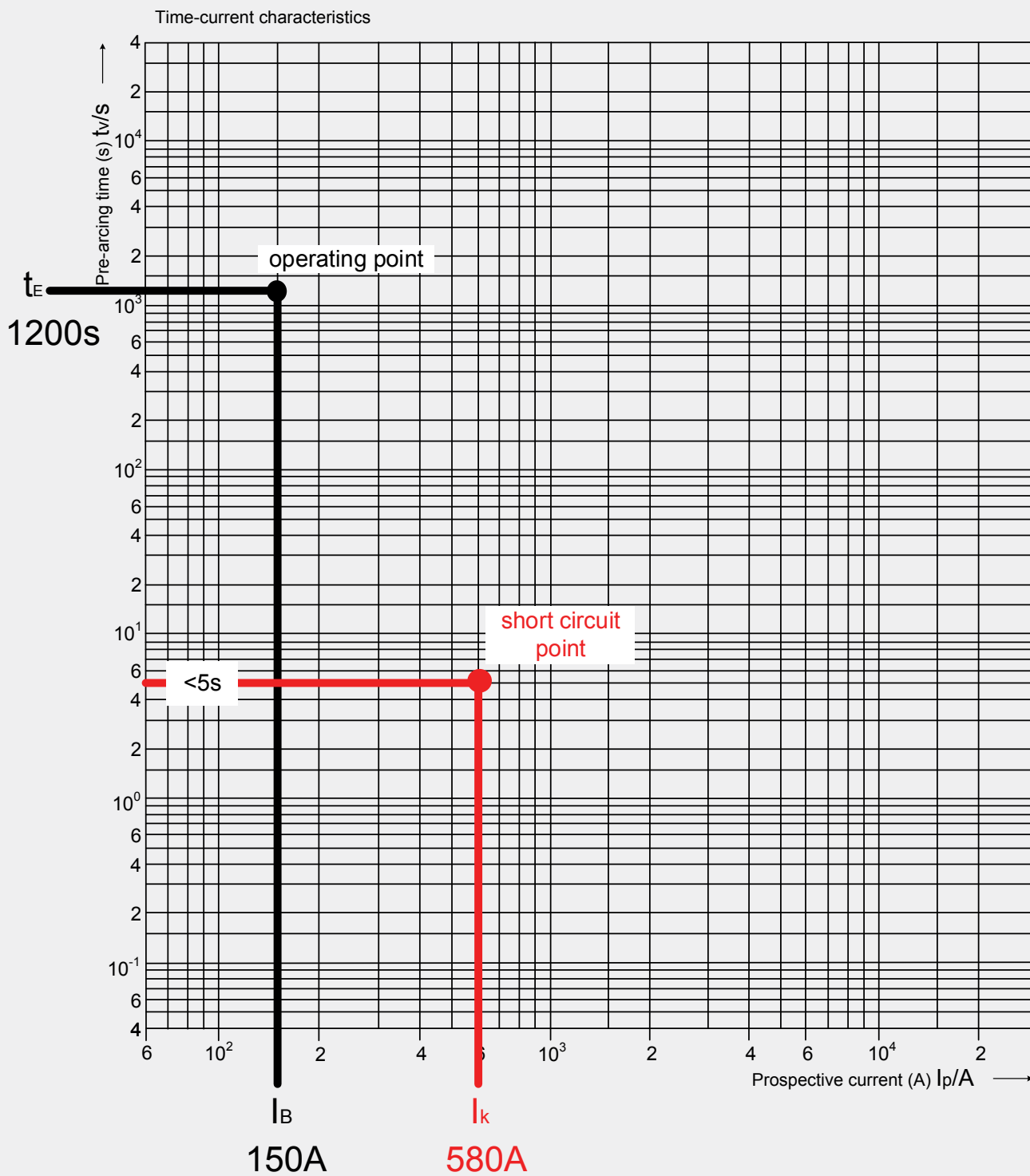


1. Short circuit point (I_k):



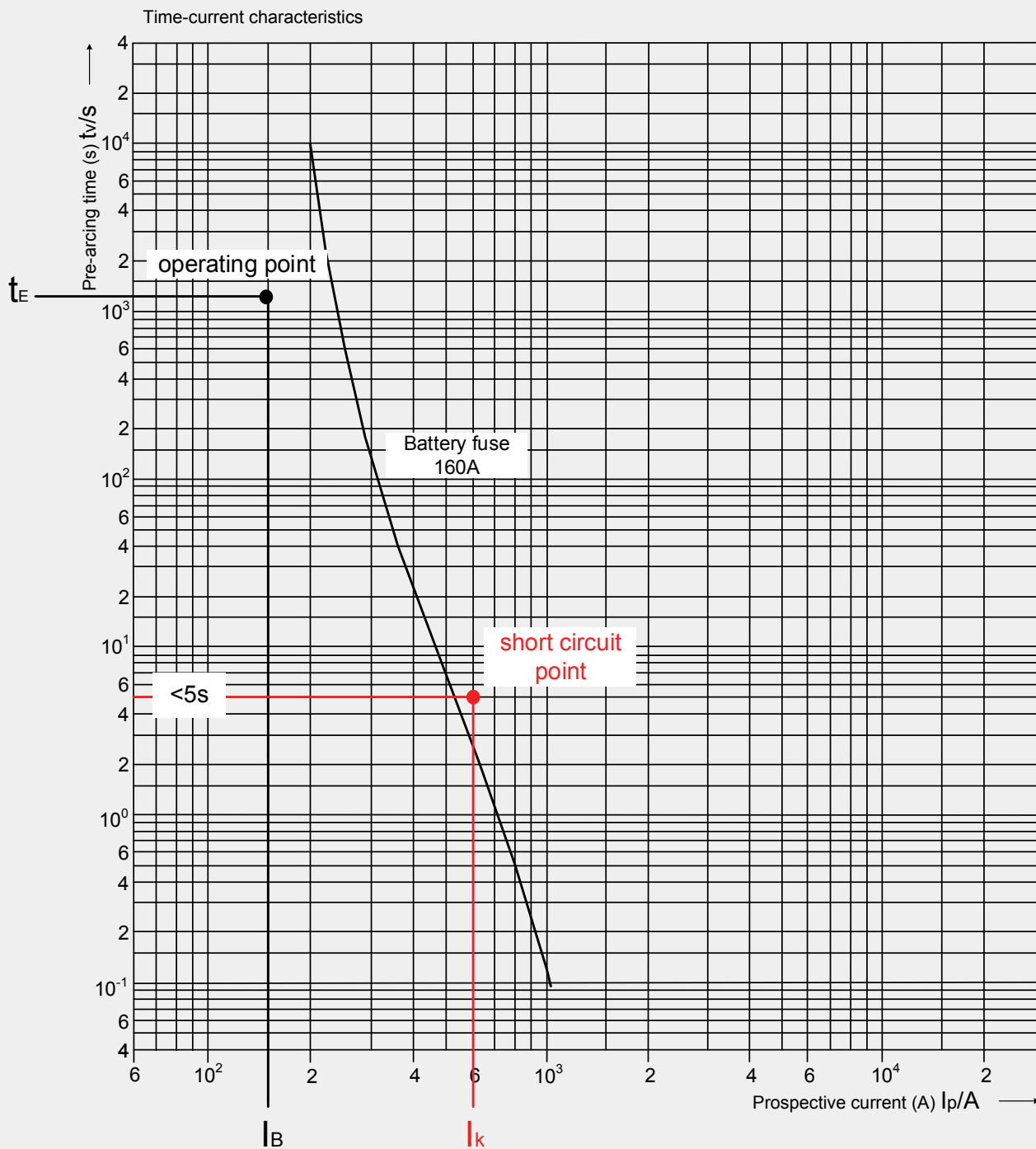


2. Operating point (t_E/I_B):

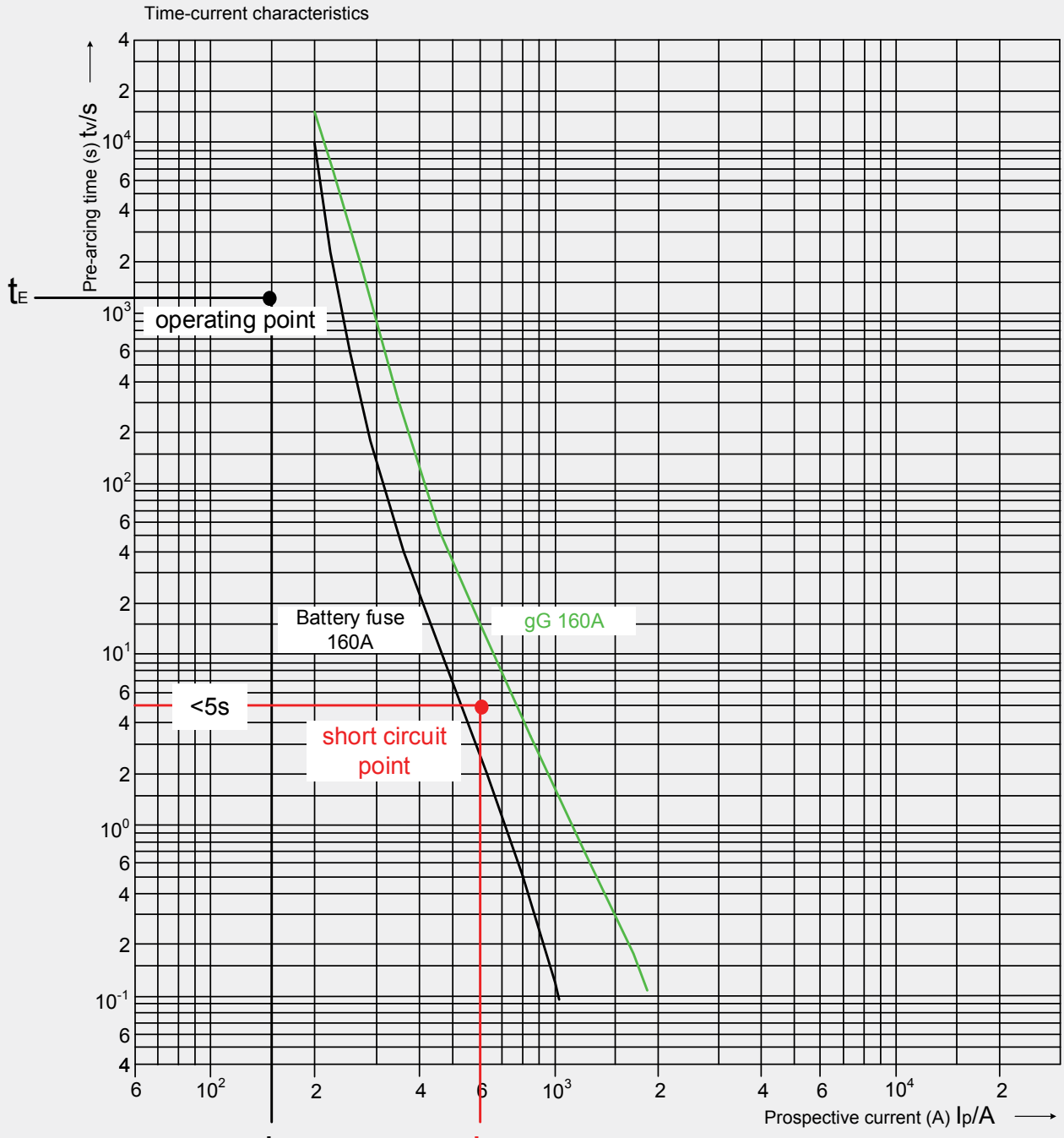




Battery fuse selection-I/t characteristic



Green protect - gBat



Required operating time

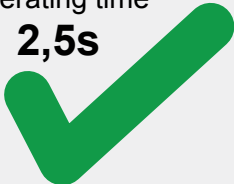
<5s

Battery fuse 700V d.c.

160A

operating time

2,5s



~~gG fuse 160A~~
operating time

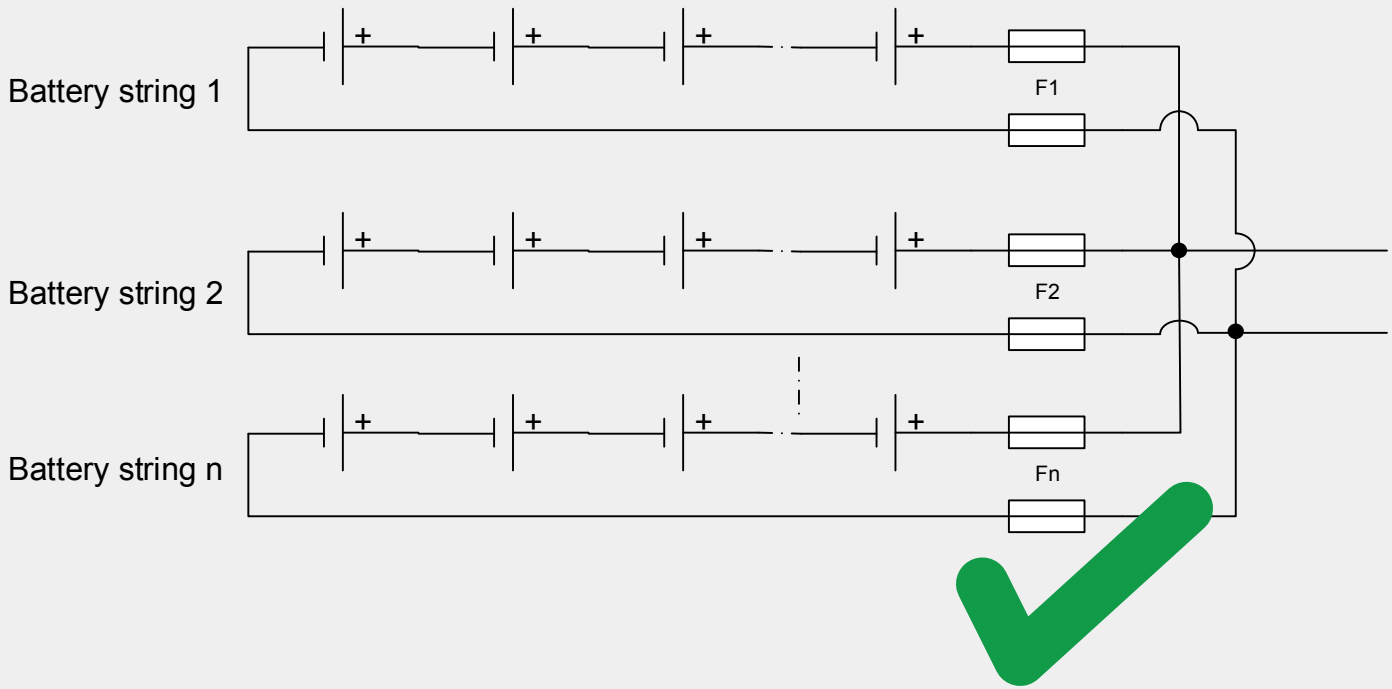
~~15s~~

~~MCB 160A~~
operating time

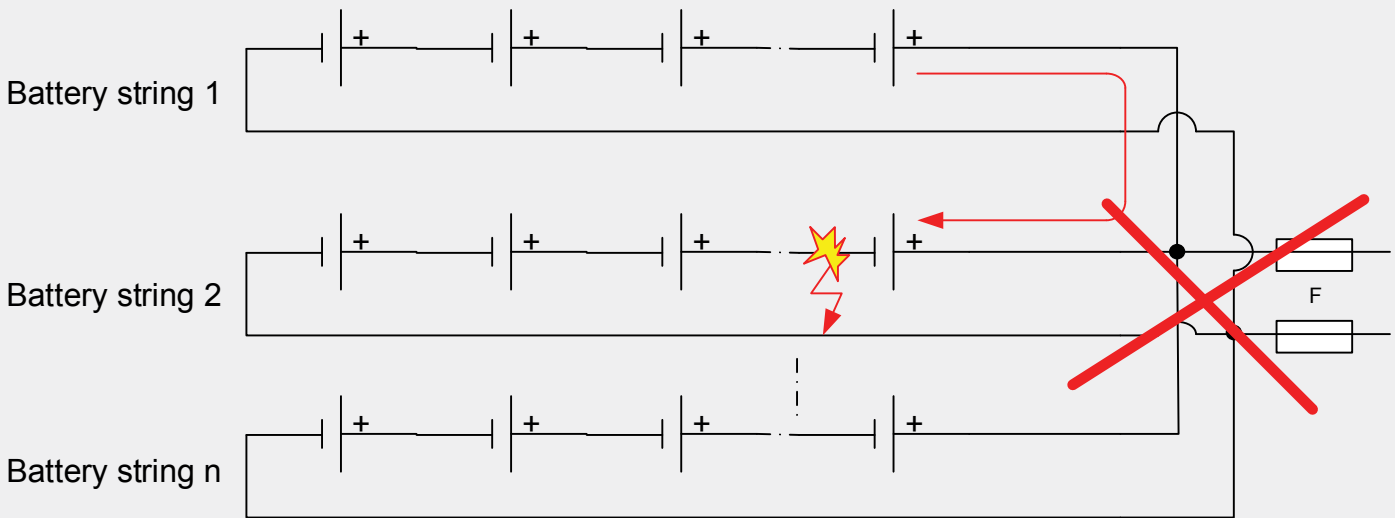
~~~30s~~



### Battery array



### Battery array



For battery banks with parallel strings, a good practice is to include overcurrent protection for each battery string. This minimizes the potential of the bank backfeeding a single shorted battery, which can lead to fires and property damage.

Battery-string fusing is best accomplished with appropriately sized dc-rated fuses secured in bolt-in fuse holders that are housed in a single enclosure. This arrangement makes it easy to isolate one battery string for testing or maintenance while allowing the system to continue operation. Individual battery-string fuses can provide protection against catastrophic failure in the event of major fault in the main disconnect breaker panel or elsewhere in the battery bank. Series fuses on each battery string also reduce the available shortcircuit current levels, allowing for the use of lower ampere interrupting current rated circuit breakers for the inverter/ charger disconnects. Without the fuses, the amount of current that the circuit breaker has to interrupt during a fault could potentially exceed its rating.

# Ratings for Li-ion batteries

## Burst discharge (pulse) ratings for Li-ion batteries:

The first set of C ratings on a Li-ion tells us how fast the battery can be discharged.


30C/60C

translates to

(maximum constant discharge rate) / (Burst discharge rate)

Burst can last for <5 seconds. To figure out how many amps this rate is, you need to know the capacity of the battery pack. If the pack says that it has 2,3Ah, take that number before the Ah and multiply with 30 to get the number of amps. In this case, it would be 69A. That is rating of 30C for that pack.

The burst rate would then be  $2,3 \times 60 = 138A$  amps for less than 5 seconds.



**Specifications: Hypersonic 2300 6.6V**

|                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product Summary:</b><br>2S1P cell configuration Li Ion<br>Deans Ultra output/charge<br>connector Balancing connector<br>(Balancing only with Sonic Charge™) | <b>Voltage:</b> 6.6V<br><b>Capacity:</b> 2300 mAh<br><b>Max C-rate cont.</b> 30C<br><b>Max C-rate pulse</b> 60C<br><b>Max Current cont.</b> 69A (limited by connector)<br><b>Max Current pulse</b> 138A<br><b>Max temperature*</b> 160F/71°C<br><b>Size (length x diam)</b> 135mm x 28mm<br><b>Weight:</b> 155g |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Product Specifications**

|                                |                       |
|--------------------------------|-----------------------|
| Type:                          | Lithium Ion           |
| Capacity:                      | 2300 mAh              |
| Voltage:                       | 6.6V                  |
| Connector Type:                | Deans Ultra (WSD1300) |
| Number of Cells:               | 2                     |
| Weight:                        | 155g                  |
| Configuration:                 | 2S1P                  |
| Length:                        | 5.31 in (135mm)       |
| Width:                         | 1.10 in (28.0mm)      |
| Height:                        | 1.10 in (28.0mm)      |
| Maximum Continuous Discharge : | 30C                   |
| Maximum Burst Discharge :      | 60C                   |

## Examples of maximum discharge current for Lead-acid and Li-ion batteries:

|                                                  |        |
|--------------------------------------------------|--------|
| Internal Resistance (Fully Charged Battery)..... | <12m Ω |
| Maximum Discharge Current For 5 sec.(A).....     | 180A   |

|                                                    |           |
|----------------------------------------------------|-----------|
| Storage .....                                      | -20~60°C  |
| Max. Discharge Current 77°F(25°C) .....            | 1000A(5s) |
| Short Circuit Current .....                        | 3300A     |
| Charge Methods: Constant Voltage Charge 77°F(25°C) |           |

|                             |                    |
|-----------------------------|--------------------|
| Capacity                    | 20.0Ah@20m Rate    |
| Weight                      | Approx. 5.9 Kg     |
| Max. Discharge Current      | 200 A (5 sec)      |
| Internal Resistance         | Approx. 12 m Ω     |
| Operating Temperature Range | Discharge: -20°C → |

|                                             |                                |                                |
|---------------------------------------------|--------------------------------|--------------------------------|
| Continuous discharge current                | 100 A                          | 100 A                          |
| Max discharge impulse current:<br>(10 min.) | 200 A (temperature controlled) | 200 A (temperature controlled) |
| (5 sec.)                                    | >500 A                         | >500 A                         |
| (uSec.)                                     | >1000 A                        | >1000 A                        |
| Continuous charge current                   | 100 A                          | 100 A                          |

|                       |                                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Discharging Rate | <ul style="list-style-type: none"> <li>66A (30.0C), Maximum continuous discharge, Recommended</li> <li>132A (60.0C), Maximum Burst rate &lt; 5 seconds</li> </ul> |
| Dimensions (LxWxH)    | 116mm(4.6") x 38mm(1.5") x 40mm(1.6")                                                                                                                             |
| Weight                | 10.8 Oz (300 g)                                                                                                                                                   |

## A few reasons why protection of batteries with simple fuse link is not OK:

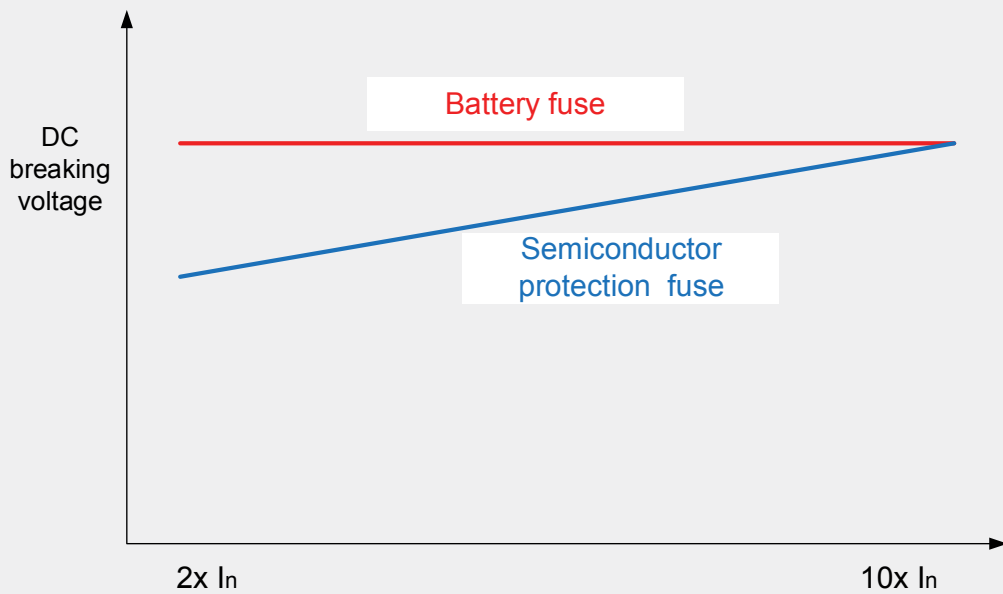
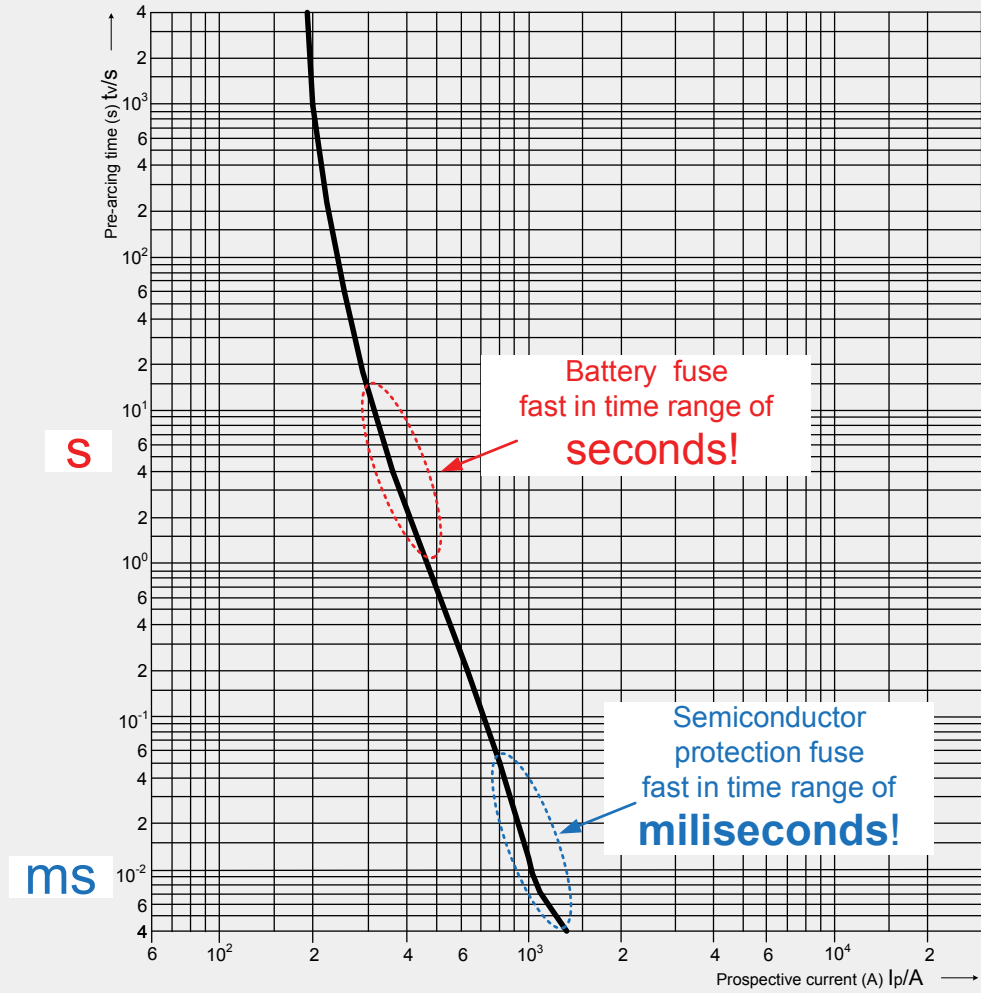
- ✓ Flammable hydrogen gas is always present during battery recharging. Hydrogen gas is potentially explosive if allowed to accumulate in a closed area.
- ✓ Prevent open flames, sparks, or **electrical arcs** in the battery charging area to minimize the danger of explosion.
- ✓ Breaking capacity of »fork lift fuse link« is less than 1kA at nominal voltage!





### Comparison characteristics

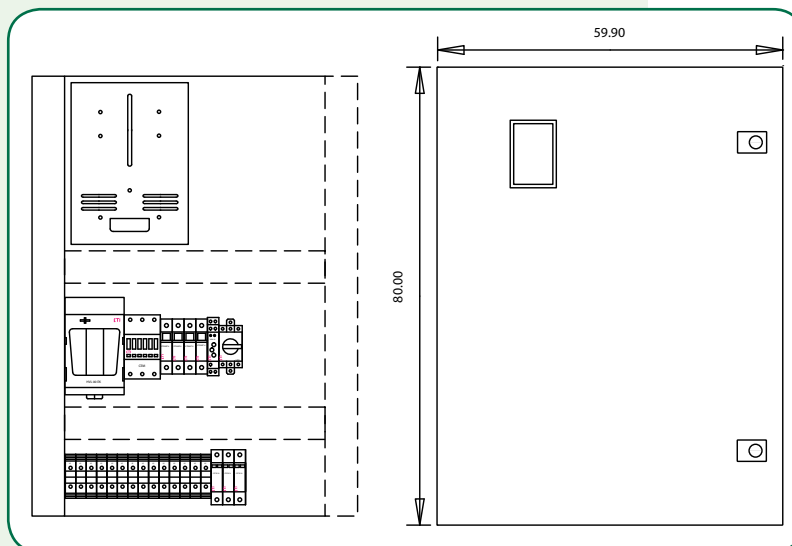
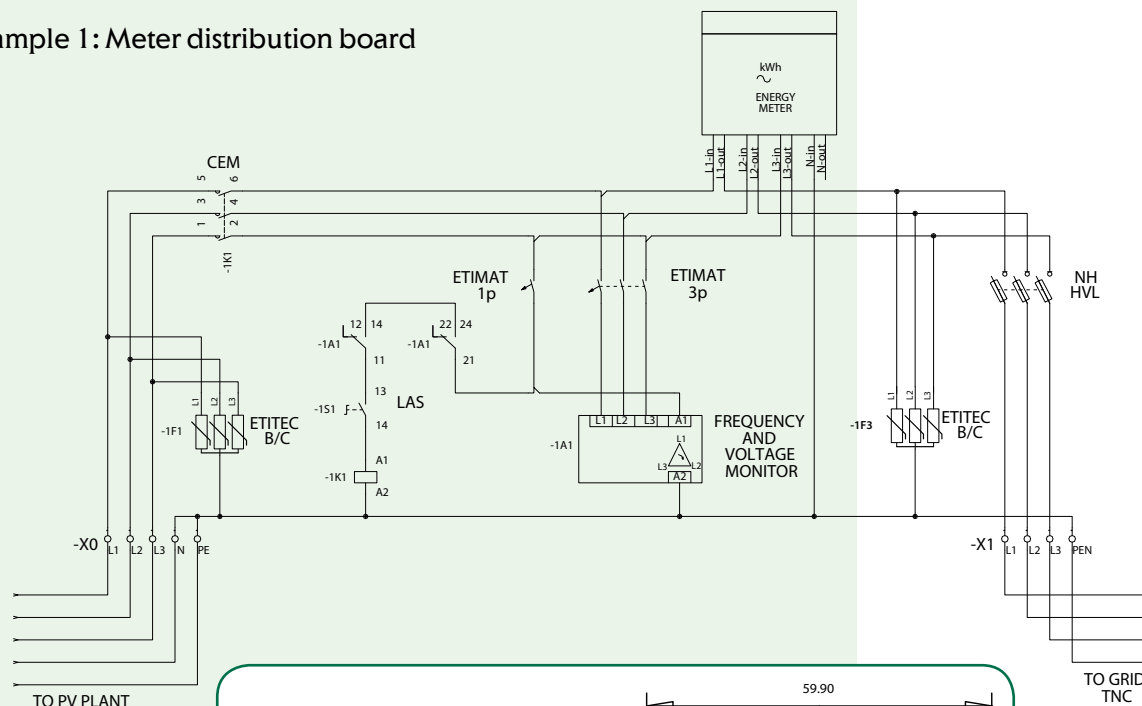
Battery fuse ← → Semiconductor protection fuse





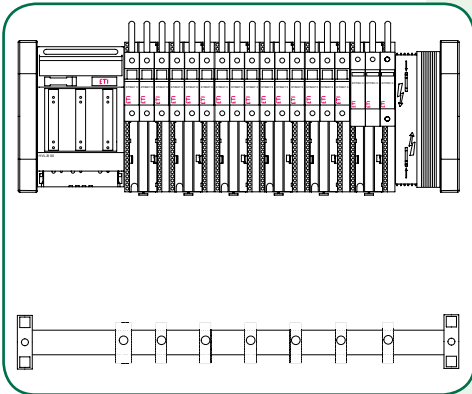
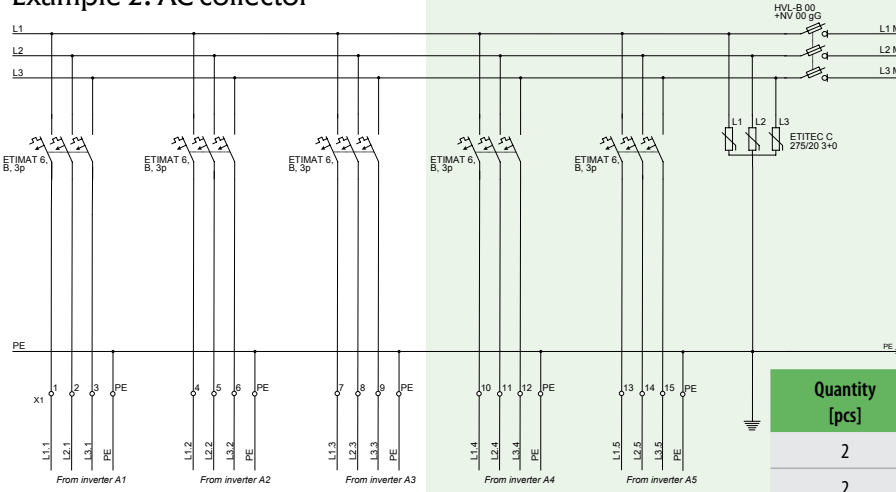
# Solutions

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              | 002111512 | 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, VP0                      |
| 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                   |

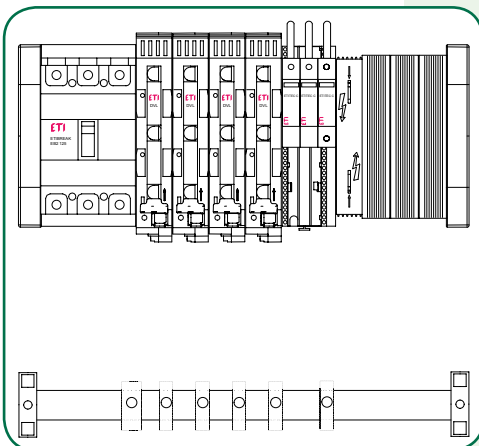
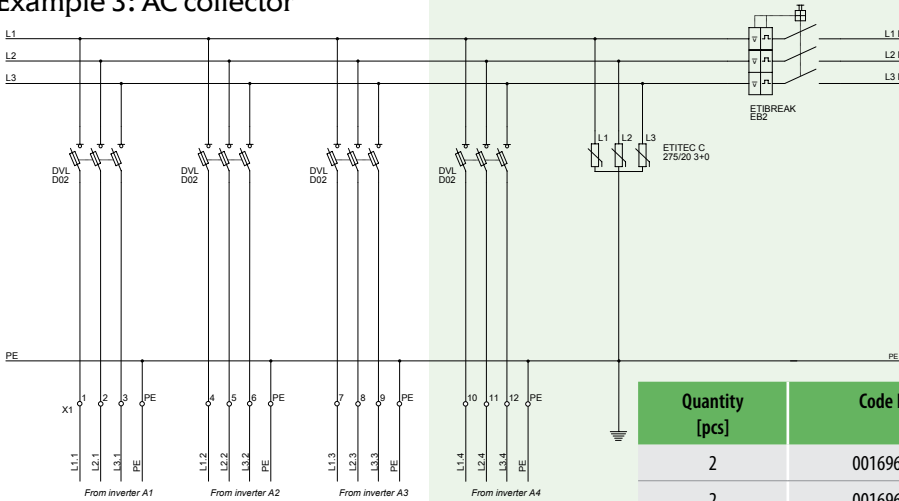
### Example 2: AC collector



| 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

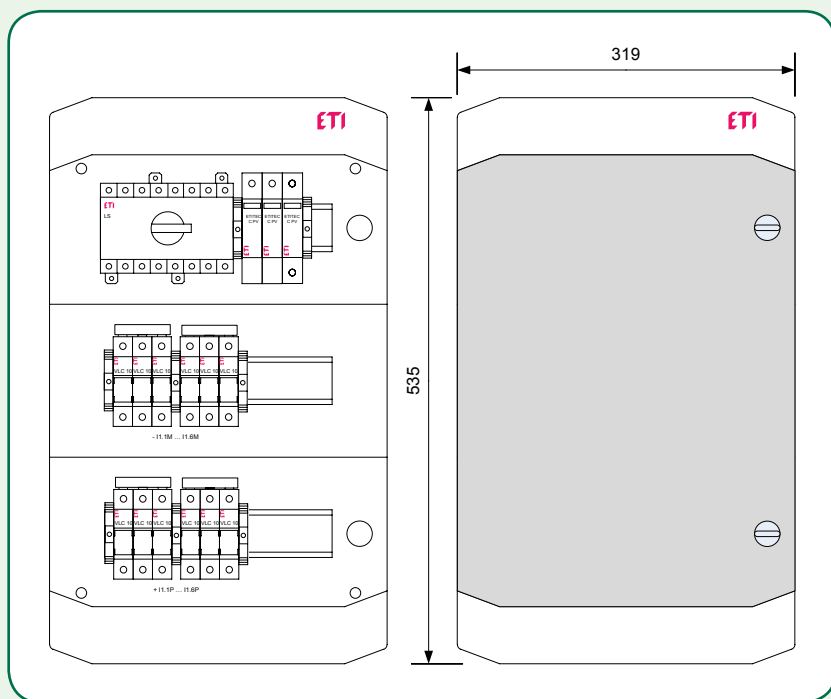
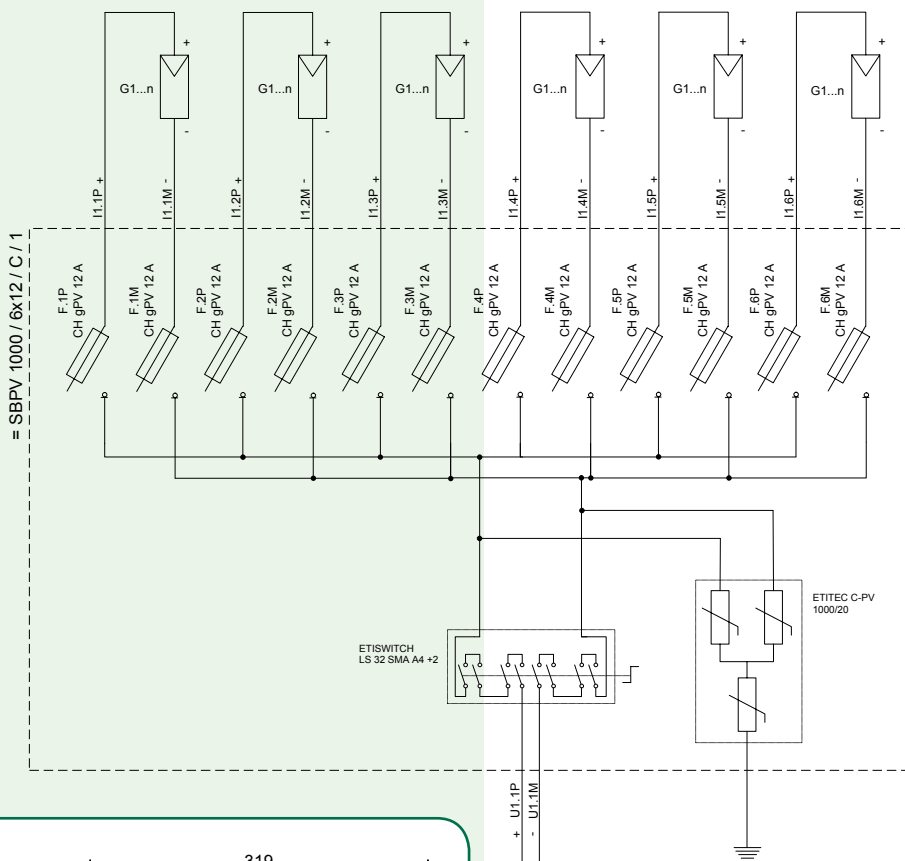
### Example 3: AC collector



| 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

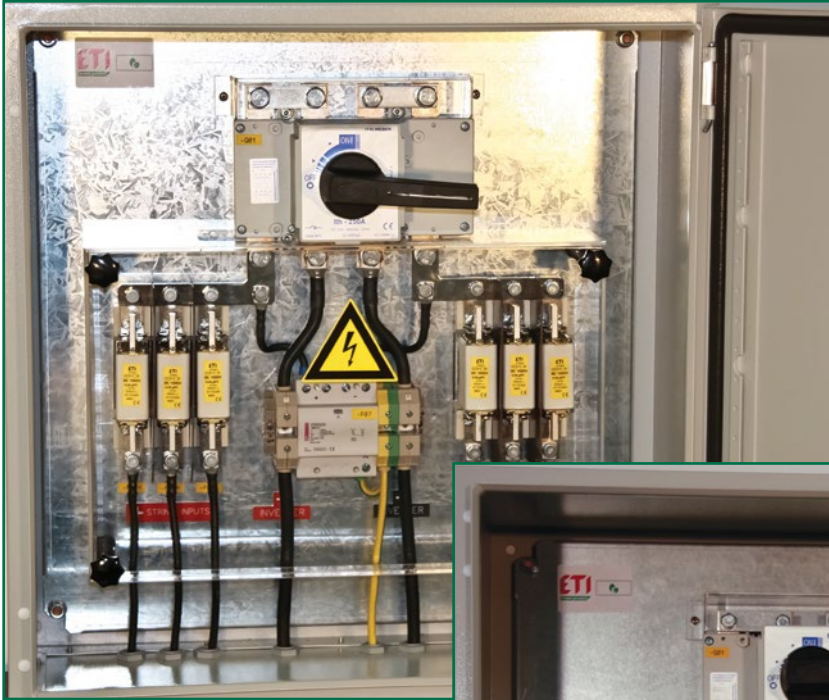
### Example 4: DC junction box



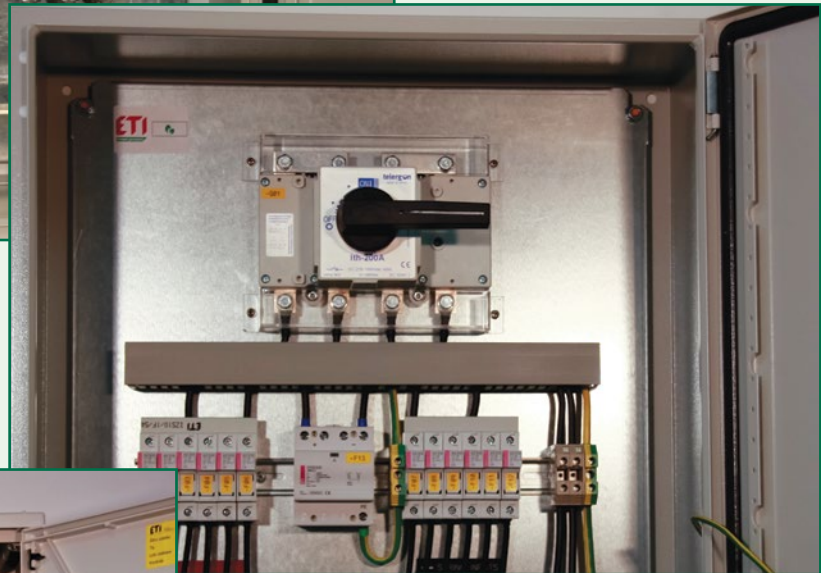
| Quantity [pcs] | Code No.  | Description         |
|----------------|-----------|---------------------|
| 1              | 001101064 | ECH-36PT            |
| 12             | 002540201 | EFH 10 1p DC 1000V  |
| 0,25           | 002921101 | IZS10/1F/54         |
| 12             | 002625106 | CH10 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

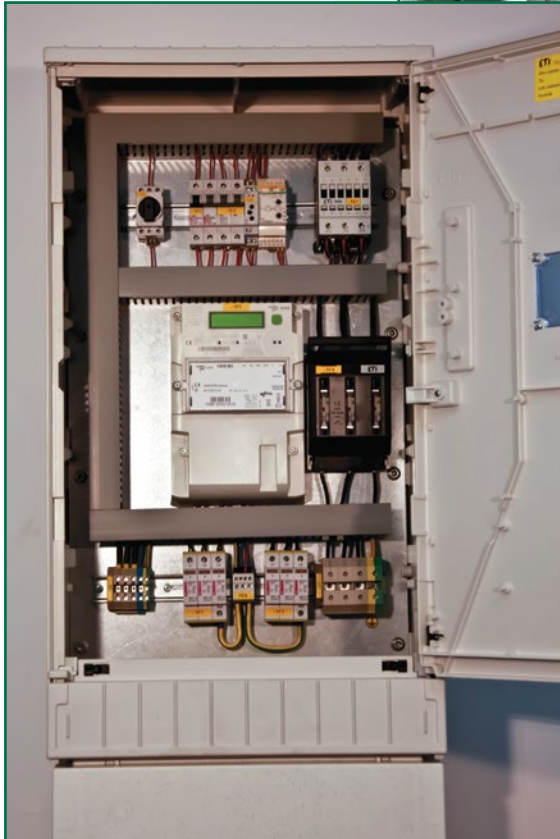
DC junction box (NH gPV fuses)



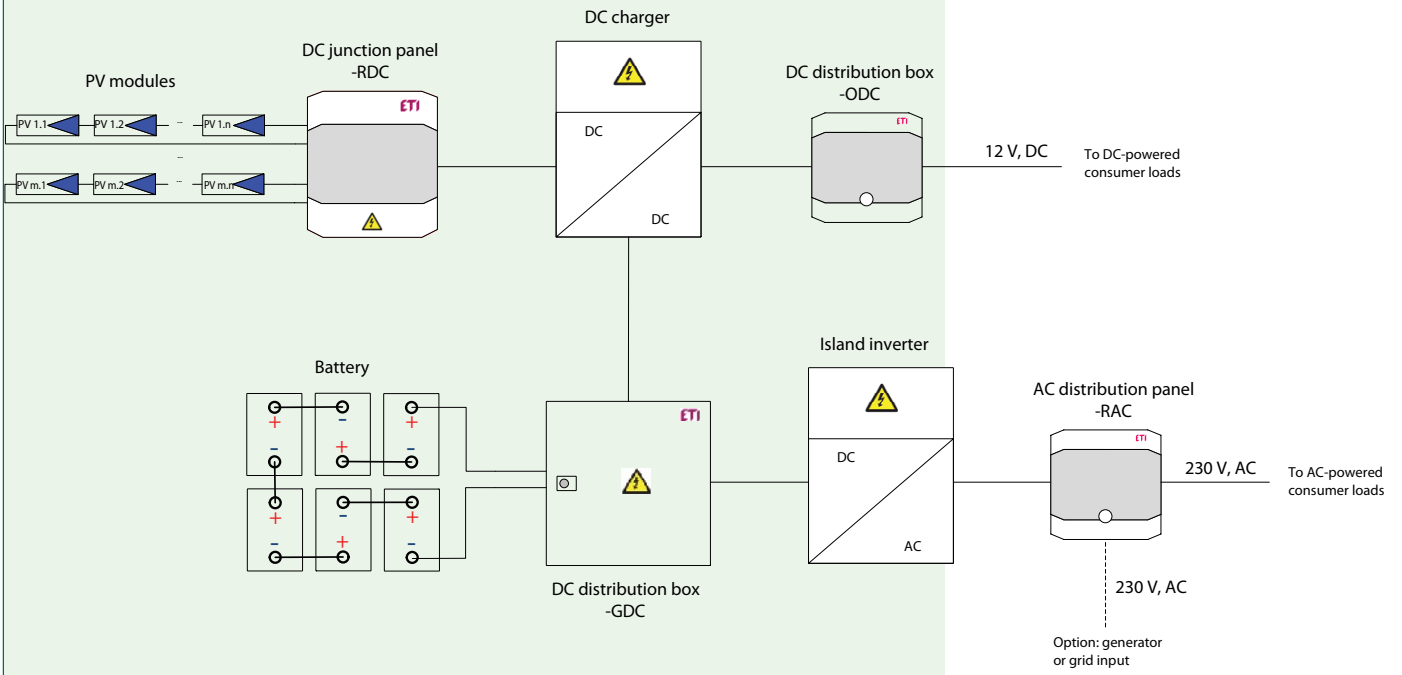
DC junction box (CH gPV fuses)



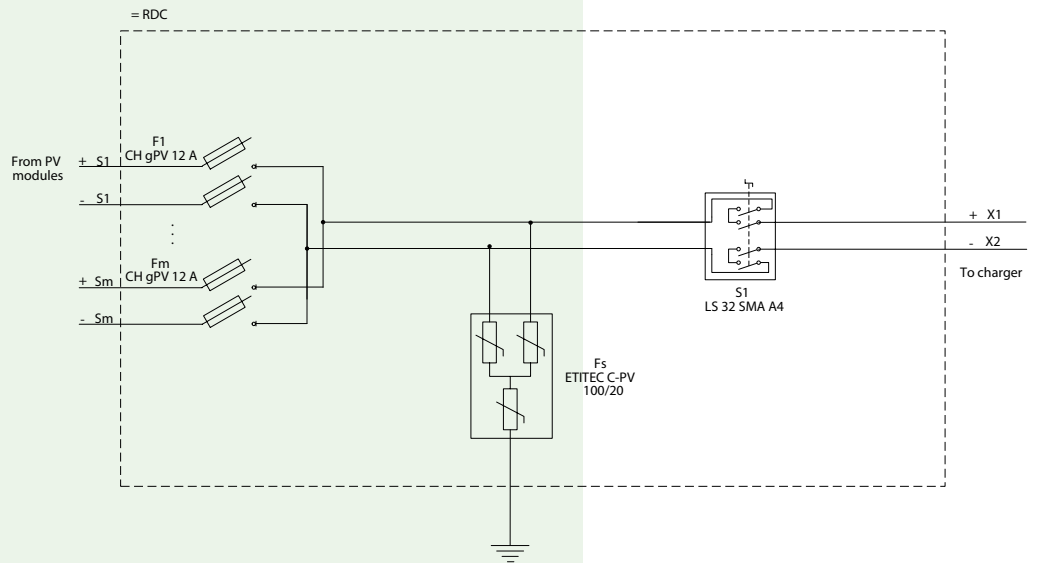
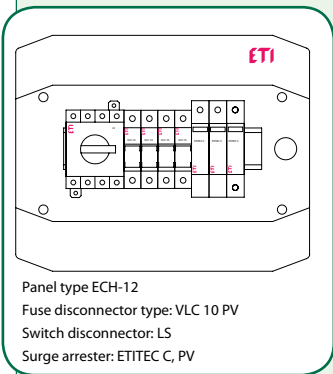
Meter distribution cabinet



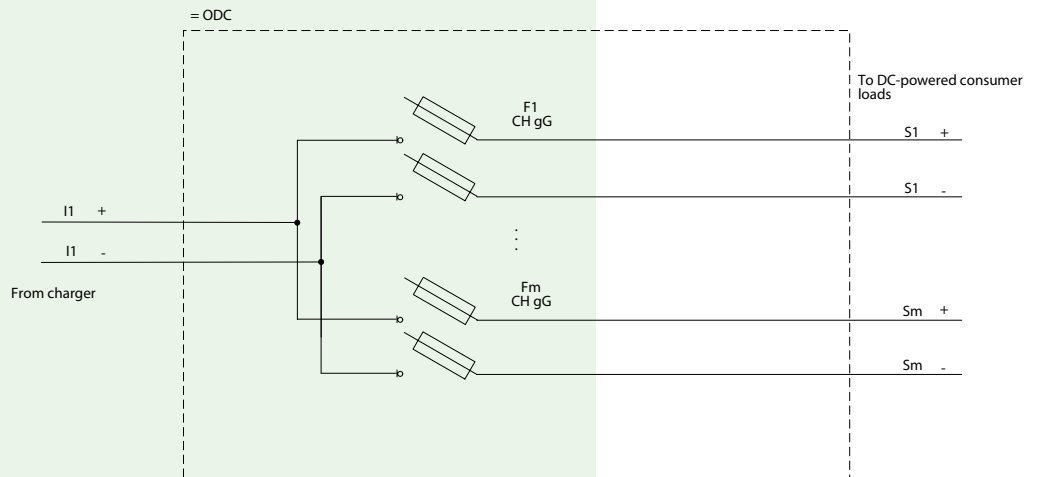
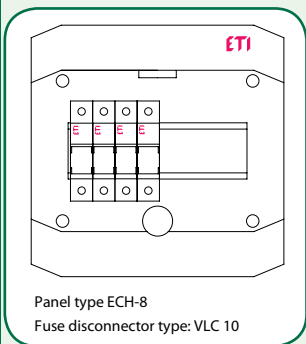
# PV off-grid system protection



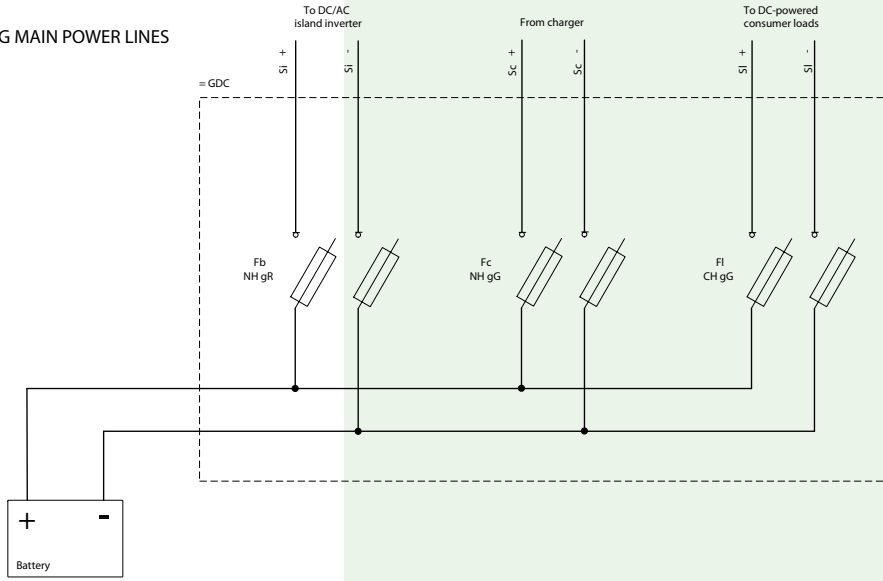
## PROTECTING DC SIDE OF ISLAND PV PLANT.



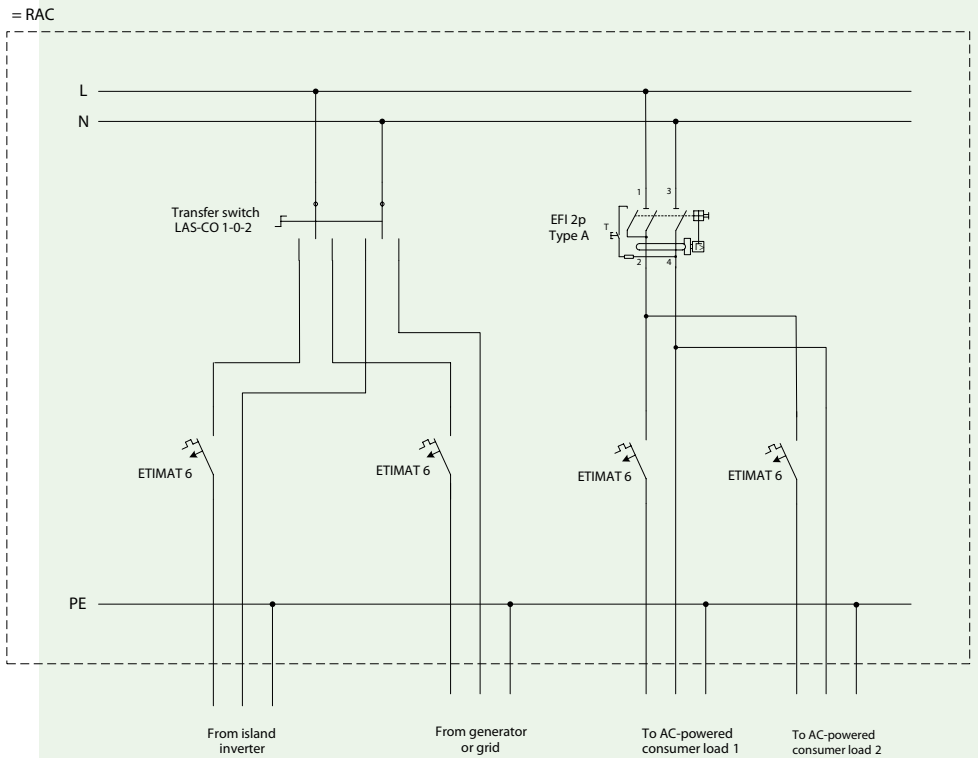
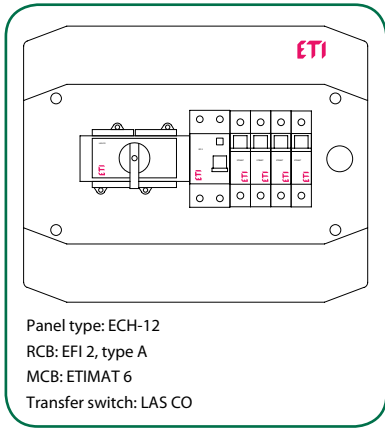
## PROTECTING DC-POWERED CONSUMER LOADS DIRECTLY FROM CHARGES.



**PROTECTING MAIN POWER LINES**



**AC DISTRIBUTION BOX**





# index

| Code No           | Page |
|-------------------|------|
| <b>0011</b>       |      |
| 001101060         | 72   |
| 001101061         | 72   |
| 001101062         | 72   |
| 001101063         | 72   |
| 001101064         | 72   |
| 001101065         | 72   |
| 001103001         | 73   |
| 001103002         | 73   |
| 001103005         | 73   |
| 001103006         | 73   |
| 001103009         | 73   |
| 001103010         | 73   |
| 001103013         | 73   |
| 001103014         | 73   |
| 001103017         | 73   |
| 001103018         | 73   |
| 001103021         | 73   |
| 001103022         | 73   |
| 001103025         | 73   |
| 001103026         | 73   |
| 001103029         | 73   |
| 001103030         | 73   |
| 001103033         | 75   |
| 001103034         | 75   |
| 001103035         | 75   |
| 001103036         | 75   |
| 001103041         | 75   |
| 001103042         | 75   |
| 001103043         | 75   |
| 001103044         | 75   |
| 001103049         | 75   |
| 001103050         | 75   |
| 001103051         | 75   |
| 001103052         | 75   |
| 001103057         | 75   |
| 001103058         | 75   |
| 001103059         | 75   |
| 001103060         | 75   |
| 001103065         | 75   |
| 001103066         | 75   |
| 001103067         | 75   |
| 001103068         | 75   |
| 001103073         | 75   |
| 001103074         | 75   |
| 001103075         | 75   |
| 001103076         | 75   |
| 001103081         | 75   |
| 001103082         | 75   |
| 001103083         | 75   |
| 001103084         | 75   |
| 001103089         | 75   |
| 001103090         | 75   |
| 001103091         | 75   |
| 001103092         | 75   |
| <b>0016, 0017</b> |      |
| 001691062         | 52   |

| Code No     | Page |
|-------------|------|
| 001703005   | 19   |
| <b>0024</b> |      |
| 002440258   | 58   |
| 002440259   | 58   |
| 002440260   | 58   |
| 002440261   | 58   |
| 002440262   | 58   |
| 002440263   | 58   |
| 002440264   | 58   |
| 002440265   | 58   |
| 002440266   | 58   |
| 002440267   | 58   |
| 002440268   | 58   |
| 002440269   | 58   |
| 002440270   | 58   |
| 002440271   | 58   |
| 002440511   | 54   |
| 002440512   | 54   |
| 002440513   | 54   |
| 002440514   | 54   |
| 002440515   | 56   |
| 002440516   | 56   |
| 002440517   | 56   |
| 002440518   | 56   |
| 002440519   | 54   |
| 002440520   | 54   |
| 002440521   | 54   |
| 002440522   | 54   |
| 002440523   | 56   |
| 002440524   | 56   |
| 002442988   | 62   |
| 002442989   | 62   |
| 002445300   | 61   |
| 002445301   | 61   |
| 002445302   | 61   |
| 002445303   | 61   |
| 002445304   | 61   |
| 002445305   | 61   |
| 002445306   | 61   |
| 002445307   | 61   |
| 002445308   | 61   |
| 002445309   | 61   |
| 002445310   | 61   |
| 002445311   | 61   |
| 002445312   | 61   |
| 002445313   | 61   |
| 002445320   | 61   |
| 002445321   | 61   |
| 002445322   | 61   |
| 002445323   | 61   |
| 002445324   | 61   |
| 002445325   | 61   |
| 002445326   | 61   |
| <b>0025</b> |      |
| 002540201   | 15   |
| 002540203   | 15   |
| <b>0026</b> |      |
| 002625065   | 7    |
| 002625067   | 7    |
| 002625068   | 7    |
| 002625069   | 7    |
| 002625070   | 7    |
| 002625071   | 7    |
| 002625072   | 7    |
| 002625073   | 7    |
| 002625075   | 7    |
| 002625077   | 7    |
| 002625078   | 7    |
| 002625079   | 7    |
| 002625080   | 7    |
| 002625081   | 7    |
| 002625085   | 7    |
| 002625100   | 7    |
| 002625101   | 7    |
| 002625102   | 7    |
| 002625103   | 7    |
| 002625104   | 7    |
| 002625105   | 7    |
| 002625106   | 7    |
| 002625107   | 7    |
| 002625108   | 7    |
| 002625109   | 7    |
| 002625110   | 7    |
| 002625111   | 7    |
| 002625112   | 7    |
| 002625113   | 7    |
| 002625114   | 7    |
| 002625115   | 7    |
| 002625116   | 7    |
| 002625117   | 7    |
| 002625118   | 7    |
| 002625119   | 7    |
| 002625120   | 7    |
| 002625121   | 7    |
| 002625122   | 7    |
| 002625123   | 7    |
| 002625124   | 7    |
| 002625125   | 7    |
| 002625126   | 7    |

| Code No     | Page |
|-------------|------|
| 002540211   | 15   |
| 002540213   | 15   |
| 002540501   | 15   |
| 002540503   | 15   |
| 002540511   | 15   |
| 002540513   | 15   |
| 002560201   | 16   |
| 002560203   | 16   |
| 002560206   | 16   |
| 002560207   | 16   |
| 002560211   | 16   |
| 002560213   | 16   |
| 002560214   | 16   |
| 002560215   | 16   |
| <b>0026</b> |      |
| 002625065   | 7    |
| 002625067   | 7    |
| 002625068   | 7    |
| 002625069   | 7    |
| 002625070   | 7    |
| 002625071   | 7    |
| 002625072   | 7    |
| 002625073   | 7    |
| 002625075   | 7    |
| 002625077   | 7    |
| 002625078   | 7    |
| 002625079   | 7    |
| 002625080   | 7    |
| 002625081   | 7    |
| 002625085   | 7    |
| 002625100   | 7    |
| 002625101   | 7    |
| 002625102   | 7    |
| 002625103   | 7    |
| 002625104   | 7    |
| 002625105   | 7    |
| 002625106   | 7    |
| 002625107   | 7    |
| 002625108   | 7    |
| 002625109   | 7    |
| 002625110   | 7    |
| 002625111   | 7    |
| 002625112   | 7    |
| 002625113   | 7    |
| 002625114   | 7    |
| 002625115   | 7    |
| 002625116   | 7    |
| 002625117   | 7    |
| 002625118   | 7    |
| 002625119   | 7    |
| 002625120   | 7    |
| 002625121   | 7    |
| 002625122   | 7    |
| 002625123   | 7    |
| 002625124   | 7    |
| 002625125   | 7    |
| 002625126   | 7    |

| Code No     | Page |
|-------------|------|
| 002625127   | 7    |
| 002625128   | 7    |
| 002625129   | 7    |
| 002625131   | 7    |
| 002625134   | 7    |
| 002625135   | 7    |
| 002625136   | 7    |
| 002625137   | 7    |
| 002625138   | 7    |
| 002625139   | 7    |
| 002625140   | 7    |
| 002625200   | 10   |
| 002625201   | 10   |
| 002625202   | 10   |
| 002625203   | 10   |
| 002625204   | 10   |
| 002625205   | 10   |
| 002625206   | 10   |
| 002625207   | 10   |
| 002625208   | 10   |
| 002625209   | 10   |
| 002625210   | 10   |
| 002625211   | 10   |
| 002625212   | 10   |
| 002625213   | 10   |
| 002625214   | 10   |
| 002625215   | 10   |
| 002625216   | 10   |
| 002625217   | 10   |
| 002625218   | 10   |
| 002625219   | 10   |
| 002625239   | 10   |
| 002625240   | 10   |
| 002625274   | 10   |
| 002625276   | 10   |
| 002625277   | 10   |
| 002625279   | 10   |
| 002625280   | 10   |
| 002625282   | 10   |
| 002625285   | 10   |
| 002625286   | 10   |
| 002625287   | 10   |
| 002625288   | 10   |
| 002626234   | 10   |
| 002637105   | 12   |
| 002637107   | 12   |
| 002637109   | 12   |
| 002637111   | 12   |
| 002637115   | 12   |
| 002637185   | 12   |
| 002637305   | 12   |
| 002637307   | 12   |
| 002637309   | 12   |
| 002637311   | 12   |
| 002637315   | 12   |
| <b>0029</b> |      |
| 002921101   | 20   |

# index

| Code No     | Page |
|-------------|------|
| 002921111   | 20   |
| 002921121   | 20   |
| <b>0041</b> |      |
| 004110232   | 23   |
| 004110233   | 23   |
| 004110234   | 23   |
| 004110292   | 23   |
| 004110293   | 23   |
| 004110294   | 23   |
| 004110295   | 23   |
| 004110296   | 23   |
| 004110297   | 23   |
| 004110298   | 23   |
| 004110299   | 23   |
| 004110300   | 21   |
| 004110301   | 21   |
| 004110302   | 21   |
| 004110303   | 21   |
| 004110304   | 21   |
| 004110305   | 21   |
| 004110306   | 21   |
| 004110307   | 21   |
| 004110308   | 21   |
| 004110310   | 21   |
| 004110311   | 21   |
| 004110312   | 21   |
| 004110313   | 21   |
| 004110314   | 21   |
| 004110315   | 21   |
| 004110316   | 21   |
| 004110342   | 23   |
| 004110343   | 23   |
| 004110344   | 23   |
| 004110346   | 23   |
| 004110347   | 23   |
| 004110348   | 23   |
| 004110349   | 23   |
| 004110371   | 22   |
| 004110373   | 22   |
| 004110374   | 22   |
| 004110375   | 22   |
| 004110376   | 22   |
| 004110377   | 22   |
| 004110378   | 22   |
| 004110379   | 22   |
| 004110381   | 22   |
| 004110383   | 22   |
| 004110384   | 22   |
| 004110385   | 22   |
| 004110386   | 22   |
| 004110387   | 22   |
| 004110388   | 22   |
| 004110389   | 22   |
| 004110391   | 32   |
| 004110392   | 32   |
| 004110393   | 32   |
| 004110394   | 32   |

| Code No   | Page |
|-----------|------|
| 004110395 | 32   |
| 004110396 | 32   |
| 004110397 | 32   |
| 004110398 | 32   |
| 004110399 | 32   |
| 004110400 | 32   |
| 004110401 | 32   |
| 004110410 | 29   |
| 004110411 | 29   |
| 004110413 | 29   |
| 004110414 | 29   |
| 004110415 | 29   |
| 004110416 | 29   |
| 004110417 | 29   |
| 004110418 | 29   |
| 004110419 | 29   |
| 004110420 | 29   |
| 004110421 | 29   |
| 004110423 | 29   |
| 004110424 | 29   |
| 004110425 | 29   |
| 004110426 | 29   |
| 004110427 | 29   |
| 004110428 | 29   |
| 004110429 | 29   |
| 004110430 | 29   |
| 004110431 | 29   |
| 004110432 | 29   |
| 004110433 | 29   |
| 004110434 | 29   |
| 004110435 | 29   |
| 004110436 | 29   |
| 004110437 | 29   |
| 004110438 | 29   |
| 004110439 | 29   |
| 004110440 | 29   |
| 004110441 | 29   |
| 004110442 | 29   |
| 004110443 | 29   |
| 004110444 | 29   |
| 004110445 | 29   |
| 004110446 | 29   |
| 004110447 | 29   |
| 004110448 | 29   |
| 004110449 | 29   |
| 004110450 | 29   |
| 004110451 | 29   |
| 004110452 | 29   |
| 004110453 | 29   |
| 004110454 | 29   |
| 004110455 | 23   |
| 004110456 | 23   |
| 004110457 | 23   |
| 004110458 | 23   |
| 004110459 | 23   |
| 004110460 | 23   |
| 004110472 | 32   |
| 004110473 | 32   |

| Code No   | Page |
|-----------|------|
| 004110474 | 32   |
| 004110475 | 32   |
| 004110476 | 32   |
| 004110477 | 32   |
| 004110478 | 32   |
| 004110479 | 32   |
| 004110480 | 32   |
| 004110481 | 32   |
| 004110482 | 32   |
| 004110483 | 29   |
| 004110484 | 29   |
| 004110485 | 32   |
| 004110486 | 32   |
| 004110487 | 32   |
| 004110488 | 32   |
| 004110489 | 32   |
| 004110490 | 32   |
| 004110491 | 32   |
| 004110492 | 32   |
| 004110493 | 32   |
| 004110494 | 32   |
| 004110495 | 32   |
| 004110496 | 32   |
| 004110497 | 32   |
| 004110498 | 32   |
| 004110560 | 35   |
| 004110561 | 35   |
| 004110562 | 35   |
| 004110563 | 35   |
| 004110564 | 35   |
| 004110565 | 35   |
| 004110565 | 35   |
| 004110566 | 35   |
| 004110566 | 35   |
| 004110567 | 35   |
| 004110567 | 35   |
| 004110569 | 35   |
| 004110570 | 35   |
| 004110571 | 35   |
| 004110585 | 30   |
| 004110586 | 30   |
| 004110591 | 35   |
| 004110591 | 35   |
| 004110592 | 35   |
| 004110592 | 35   |
| 004110593 | 35   |
| 004110593 | 35   |
| 004110594 | 35   |
| 004110594 | 35   |
| 004110595 | 35   |
| 004110595 | 35   |
| 004110596 | 35   |
| 004110596 | 35   |
| 004110597 | 35   |
| 004110597 | 35   |
| 004110598 | 35   |
| 004110598 | 35   |
| 004110602 | 35   |

| Code No   | Page |
|-----------|------|
| 004110603 | 35   |
| 004110604 | 35   |
| 004110606 | 35   |
| 004110606 | 35   |
| 004110607 | 35   |
| 004110607 | 35   |
| 004110608 | 35   |
| 004110608 | 35   |
| 004110609 | 35   |
| 004110609 | 35   |
| 004110610 | 35   |
| 004110610 | 35   |
| 004110611 | 35   |
| 004110611 | 35   |
| 004110612 | 35   |
| 004110612 | 35   |
| 004110613 | 35   |
| 004110613 | 35   |
| 004110617 | 35   |
| 004110618 | 35   |
| 004110619 | 35   |
| 004110621 | 35   |
| 004110621 | 35   |
| 004110622 | 35   |
| 004110622 | 35   |
| 004110623 | 35   |
| 004110623 | 35   |
| 004110627 | 32   |
| 004110627 | 33   |
| 004110628 | 32   |
| 004110628 | 33   |
| 004110629 | 32   |
| 004110629 | 33   |
| 004110630 | 35   |
| 004110631 | 35   |
| 004110632 | 35   |
| 004110633 | 35   |
| 004110634 | 35   |
| 004110635 | 35   |
| 004110636 | 35   |
| 004110637 | 35   |
| 004110638 | 35   |
| 004110639 | 35   |
| 004110640 | 35   |
| 004110641 | 35   |
| 004110642 | 35   |
| 004110643 | 35   |
| 004110644 | 35   |
| 004110646 | 27   |
| 004110692 | 34   |
| 004110693 | 34   |
| 004110694 | 34   |
| 004110695 | 34   |
| 004110696 | 34   |
| 004110697 | 34   |
| 004122023 | 42   |
| 004122023 | 44   |
| 004122024 | 42   |

# index

| Code No   | Page |
|-----------|------|
| 004122024 | 44   |
| 004122025 | 42   |
| 004122025 | 44   |
| 004122033 | 42   |
| 004122033 | 44   |
| 004122035 | 44   |
| 004122035 | 46   |
| 004122036 | 46   |
| 004122036 | 48   |
| 004122037 | 46   |
| 004122037 | 48   |
| 004122038 | 45   |
| 004122038 | 47   |
| 004122039 | 48   |
| 004122039 | 50   |
| 004122040 | 48   |
| 004122040 | 50   |
| 004122041 | 48   |
| 004122041 | 50   |
| 004122042 | 48   |
| 004122042 | 50   |
| 004122060 | 40   |
| 004122060 | 42   |
| 004122061 | 40   |
| 004122061 | 42   |
| 004122062 | 40   |
| 004122062 | 42   |
| 004122063 | 40   |
| 004122063 | 42   |
| 004122064 | 40   |
| 004122064 | 42   |
| 004122065 | 40   |
| 004122065 | 42   |
| 004132017 | 38   |
| 004132017 | 40   |
| 004132019 | 38   |
| 004132019 | 40   |
| 004132023 | 38   |
| 004132023 | 40   |

**0046**

|           |    |
|-----------|----|
| 004660060 | 60 |
| 004660060 | 64 |
| 004660061 | 60 |
| 004660061 | 64 |
| 004660062 | 60 |
| 004660062 | 64 |
| 004660063 | 60 |
| 004660063 | 64 |
| 004660064 | 60 |
| 004660064 | 64 |
| 004660065 | 60 |
| 004660065 | 64 |
| 004660066 | 60 |
| 004660066 | 64 |
| 004660067 | 60 |
| 004660067 | 64 |
| 004661481 | 67 |

| Code No   | Page |
|-----------|------|
| 004661483 | 67   |
| 004661486 | 67   |
| 004661490 | 68   |
| 004661493 | 68   |
| 004661496 | 68   |
| 004661499 | 68   |
| 004661853 | 67   |
| 004661854 | 67   |
| 004661855 | 67   |
| 004661856 | 67   |
| 004661857 | 67   |
| 004661858 | 67   |
| 004661859 | 67   |
| 004661861 | 67   |
| 004661862 | 68   |
| 004661863 | 68   |
| 004661864 | 68   |
| 004661865 | 68   |
| 004661866 | 68   |

**0049**

|           |    |
|-----------|----|
| 004941112 | 50 |
|-----------|----|

**0067**

|           |    |
|-----------|----|
| 006710335 | 20 |
| 006710335 | 23 |
| 006710340 | 20 |
| 006710340 | 23 |
| 006710341 | 20 |
| 006710341 | 23 |





