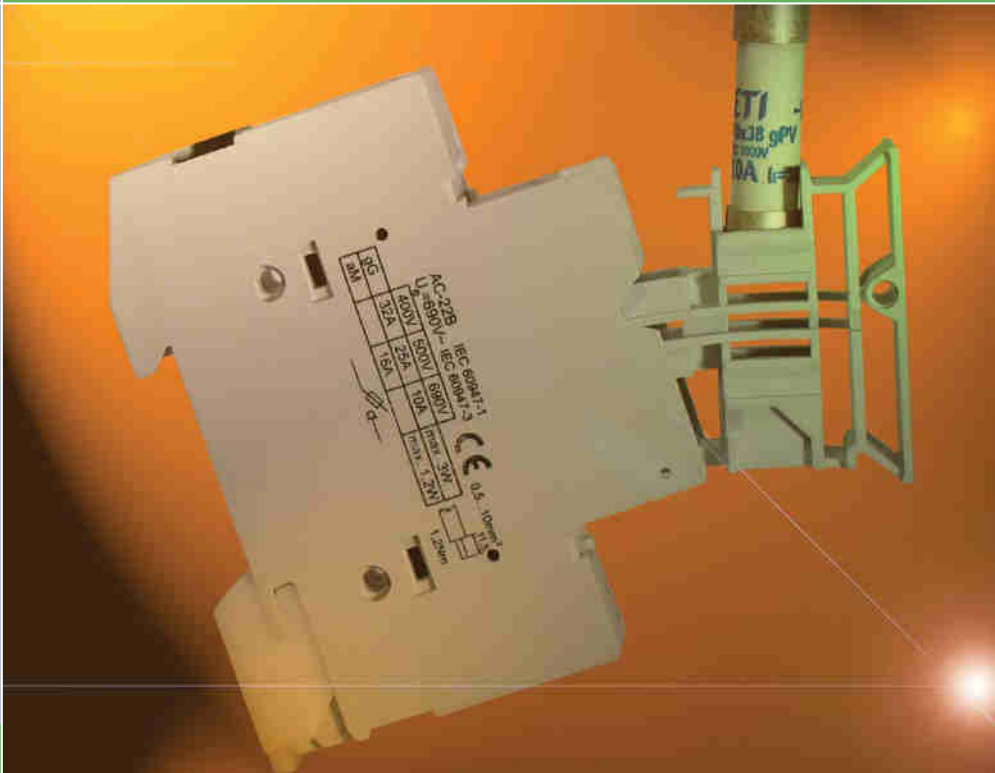


GREEN PROTECT

| | |
|--|------------|
| DC - distribution and protection components | 5 |
| Cylindrical fuse-links | 7 |
| Photovoltaic fuseholders for cylindrical fuse-links | 17 |
| Accessories for cylindrical fuses | 24 |
| NH fuse -links | 26 |
| NH fuse bases | 52 |
| NH photovoltaic fuseholders | 59 |
| Lightning and Surge Arresters | 64 |
| Switch disconnecter | 76 |
| Distribution boards | 84 |
| Ready made DC-junction boxes | 85 |
| AC - distribution and protection components | 89 |
| Solutions | 96 |
| Design on customer's request | 99 |
| Overcurrent and Overvoltage Protection for Wind | 102 |
| Power Generation | |

PROTECTION OF PV SYSTEMS





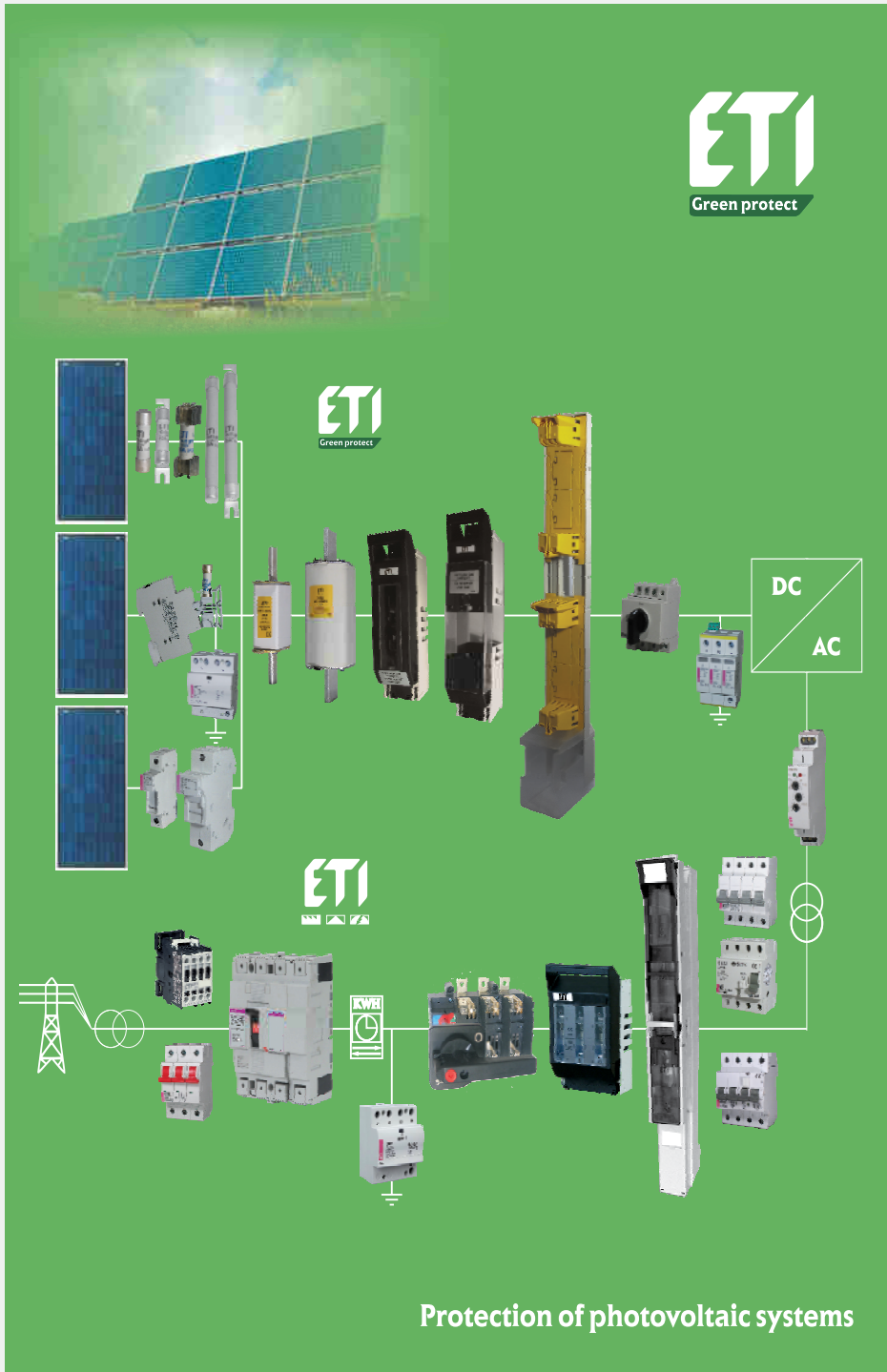
PROTECTION OF PHOTOVOLTAIC SYSTEMS

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.



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.

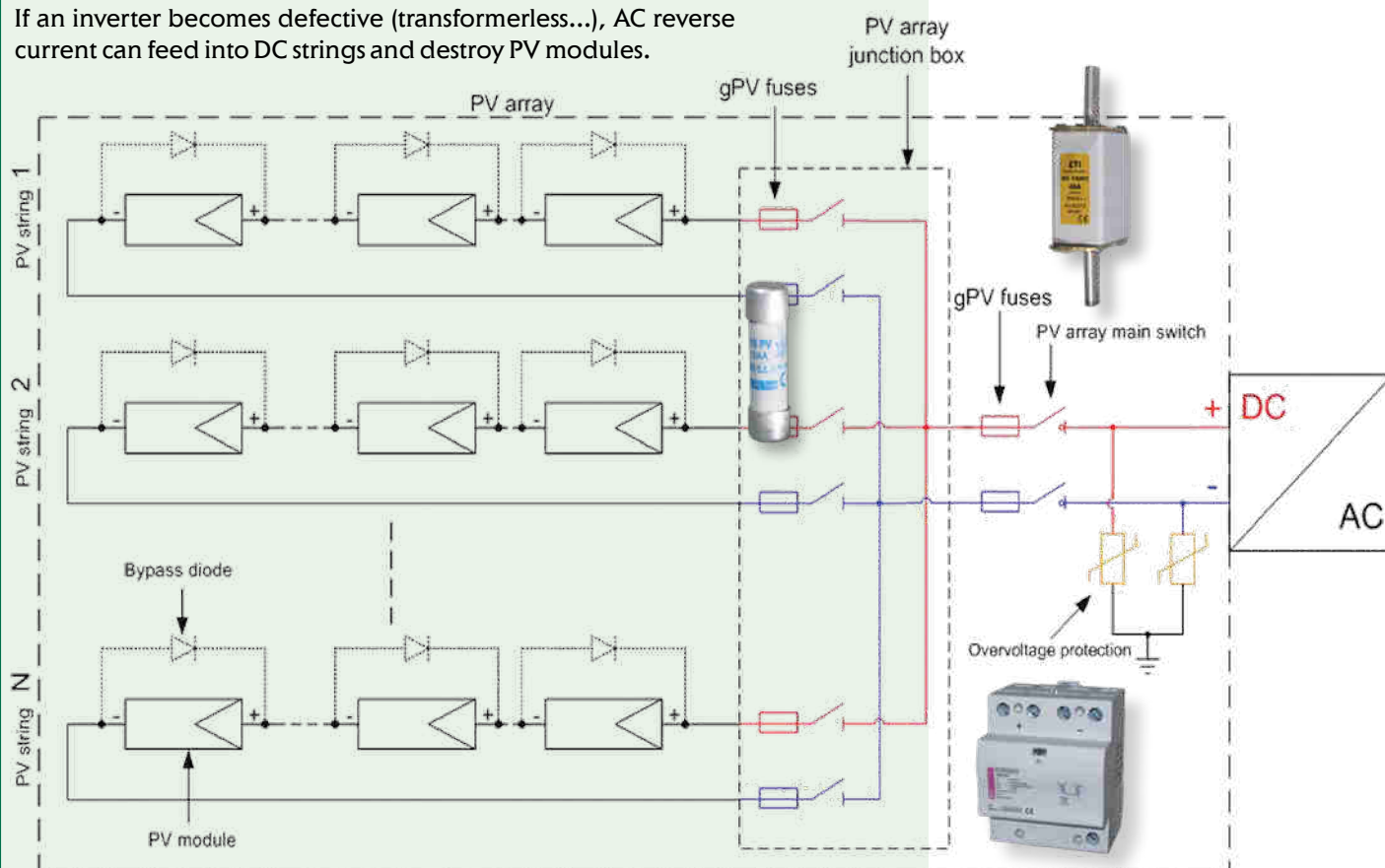
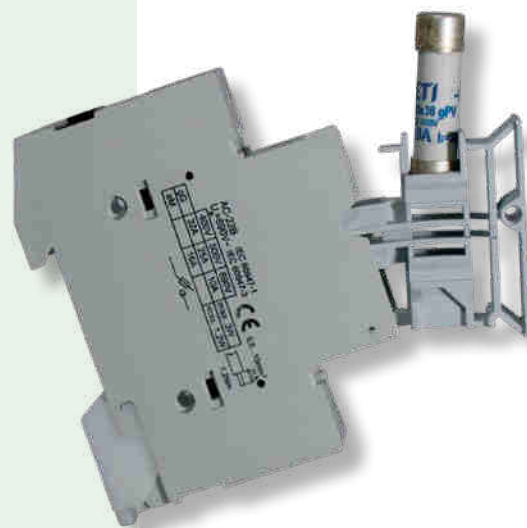
Systems that have less than three strings will not generate enough fault current to damage the conductors/solar panels.

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

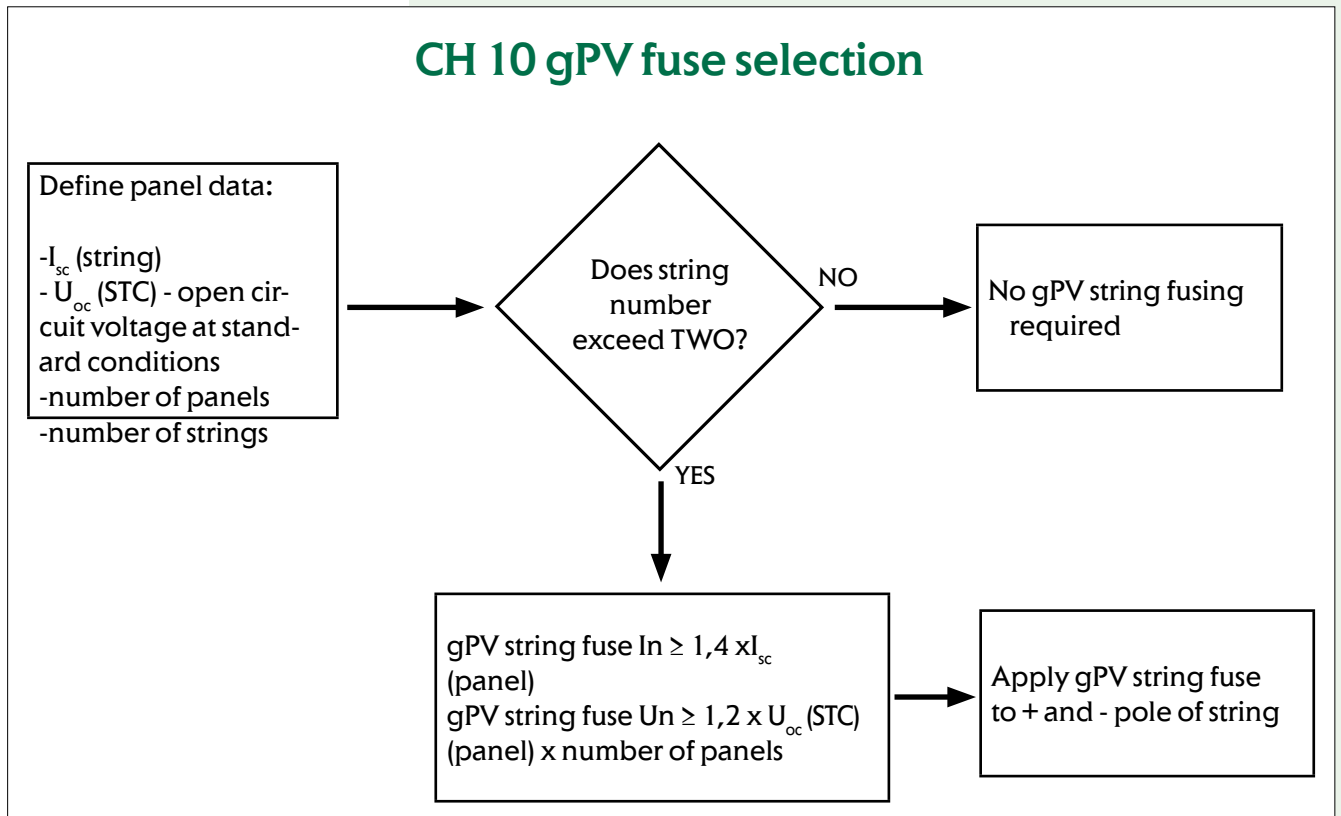
Fuses isolate the faulted string. The rest of PV system can continue to generate electricity.

■ 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.

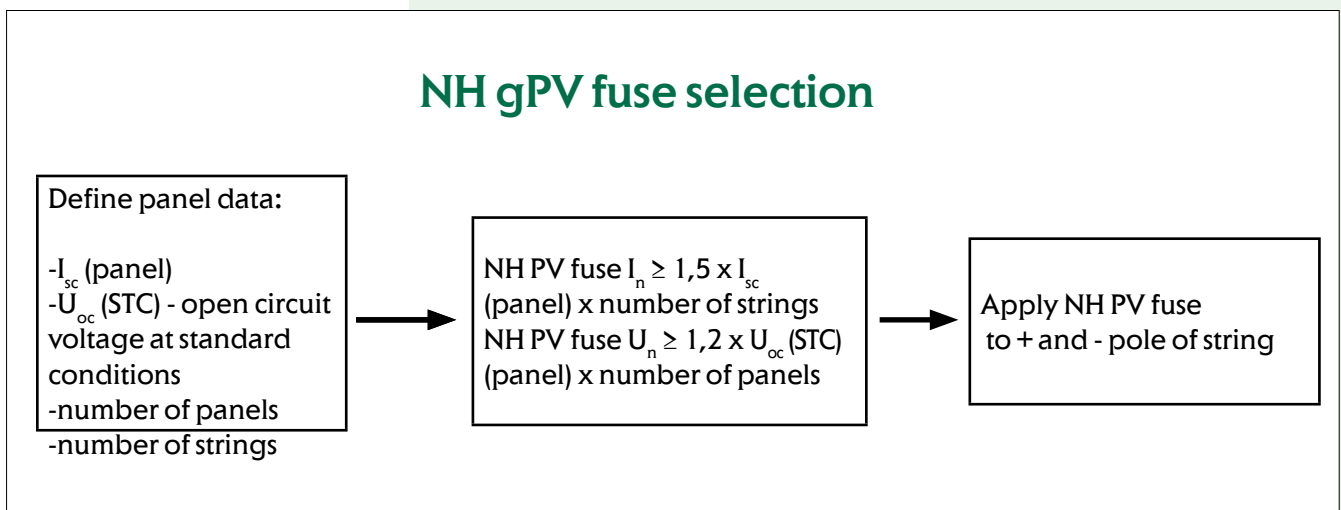


CH 10 gPV fuse selection



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

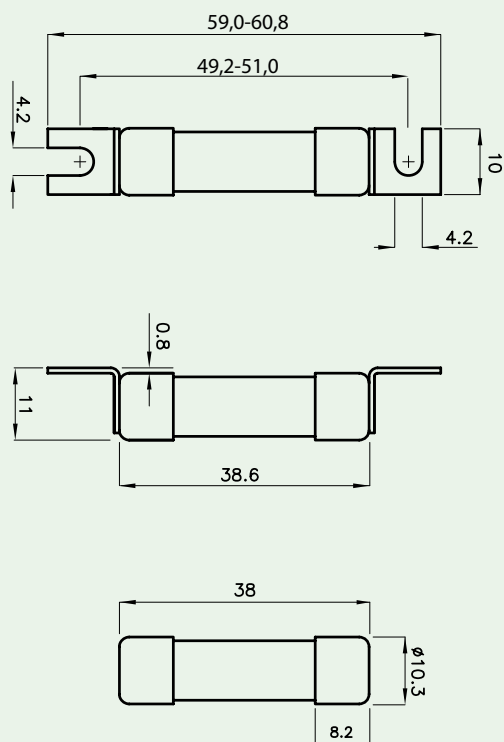
| | |
|-------------------|---|
| Rated voltage | 1000V d.c. L/R=2ms |
| Breaking capacity | 10kA d.c. / 30kA d.c. |
| Standards | UL 2579, UL 248-1 |
| Application | For protection of photovoltaic modules. |



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 ² s] L/R=2ms | Operating Joule integral [A ² s] L/R=2ms | Power dissipation [0,7 x I _n] ² P _d [W] | Power dissipation [I _n] ² P _d [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 | | | |

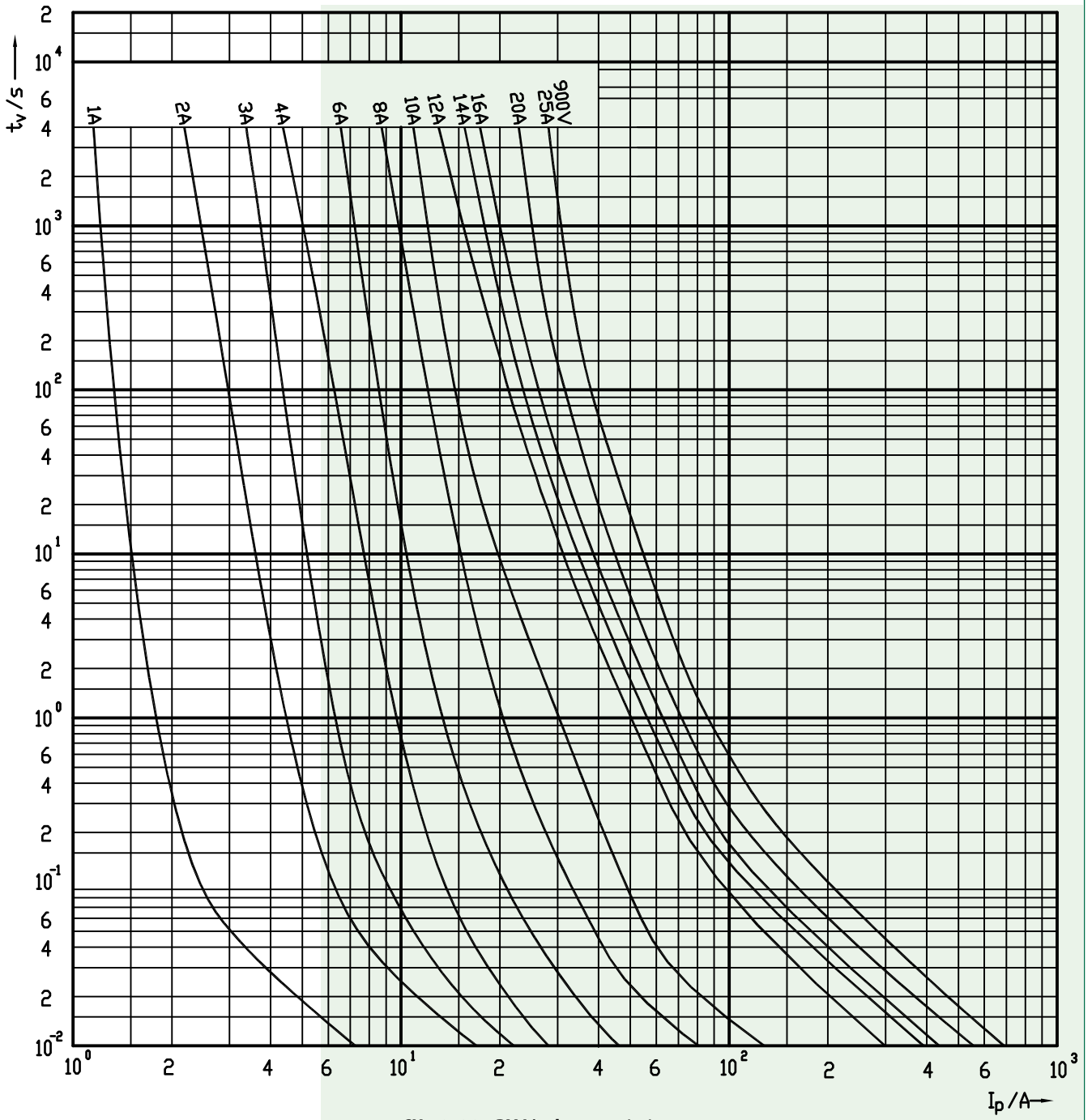
* 900V d.c.



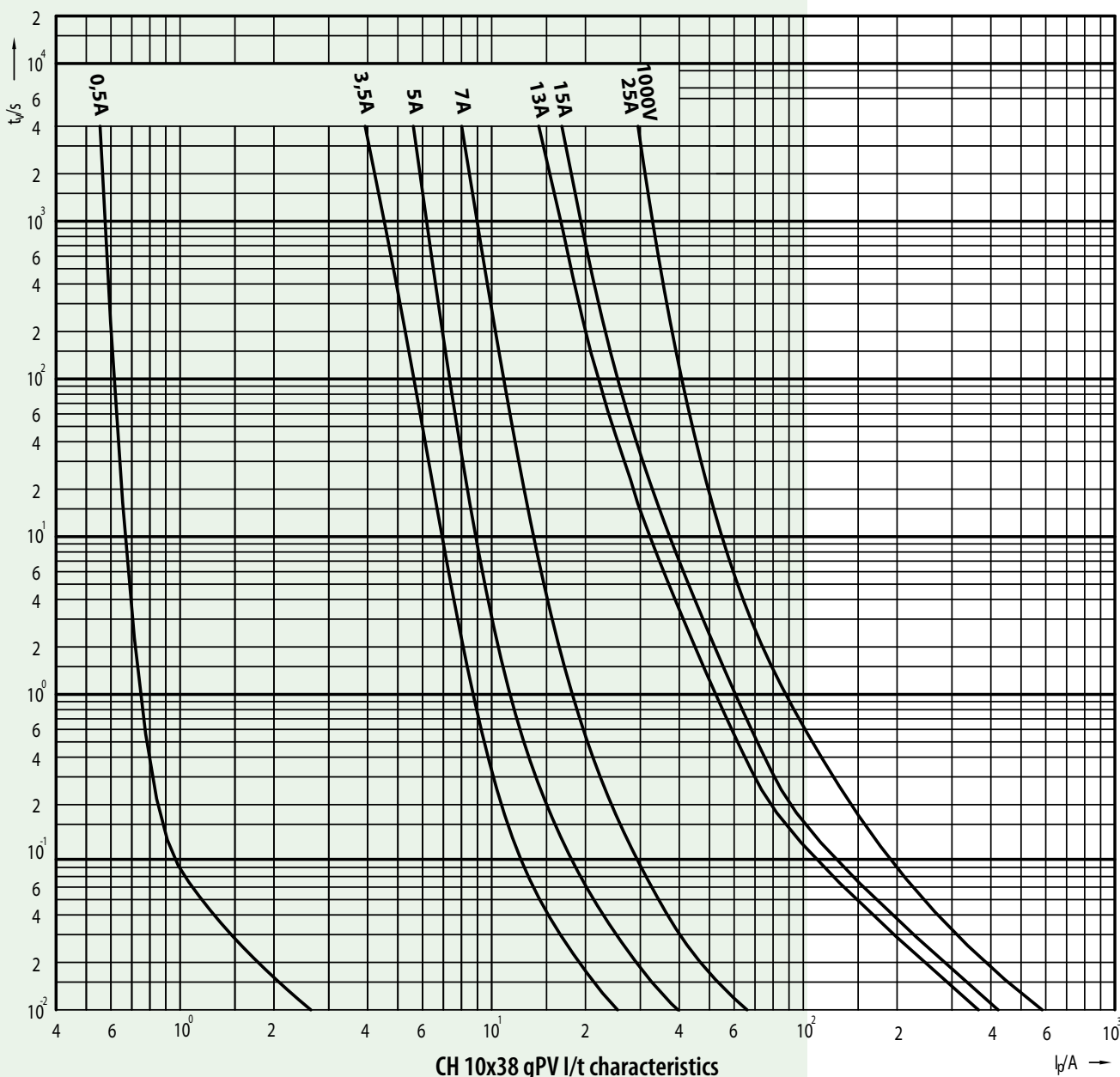
Standard Contacts



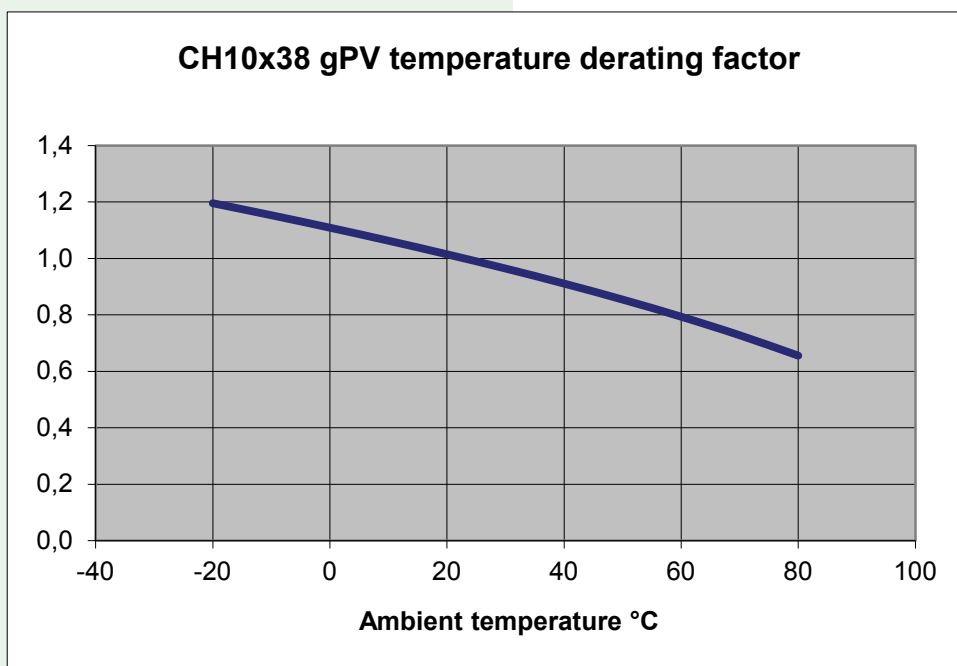
Type SU Contacts



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

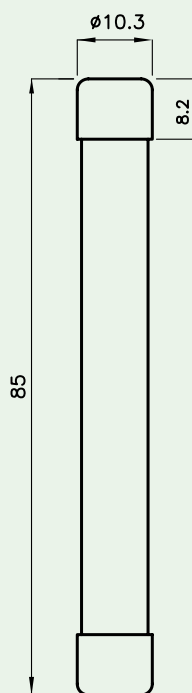
UL file: E347771

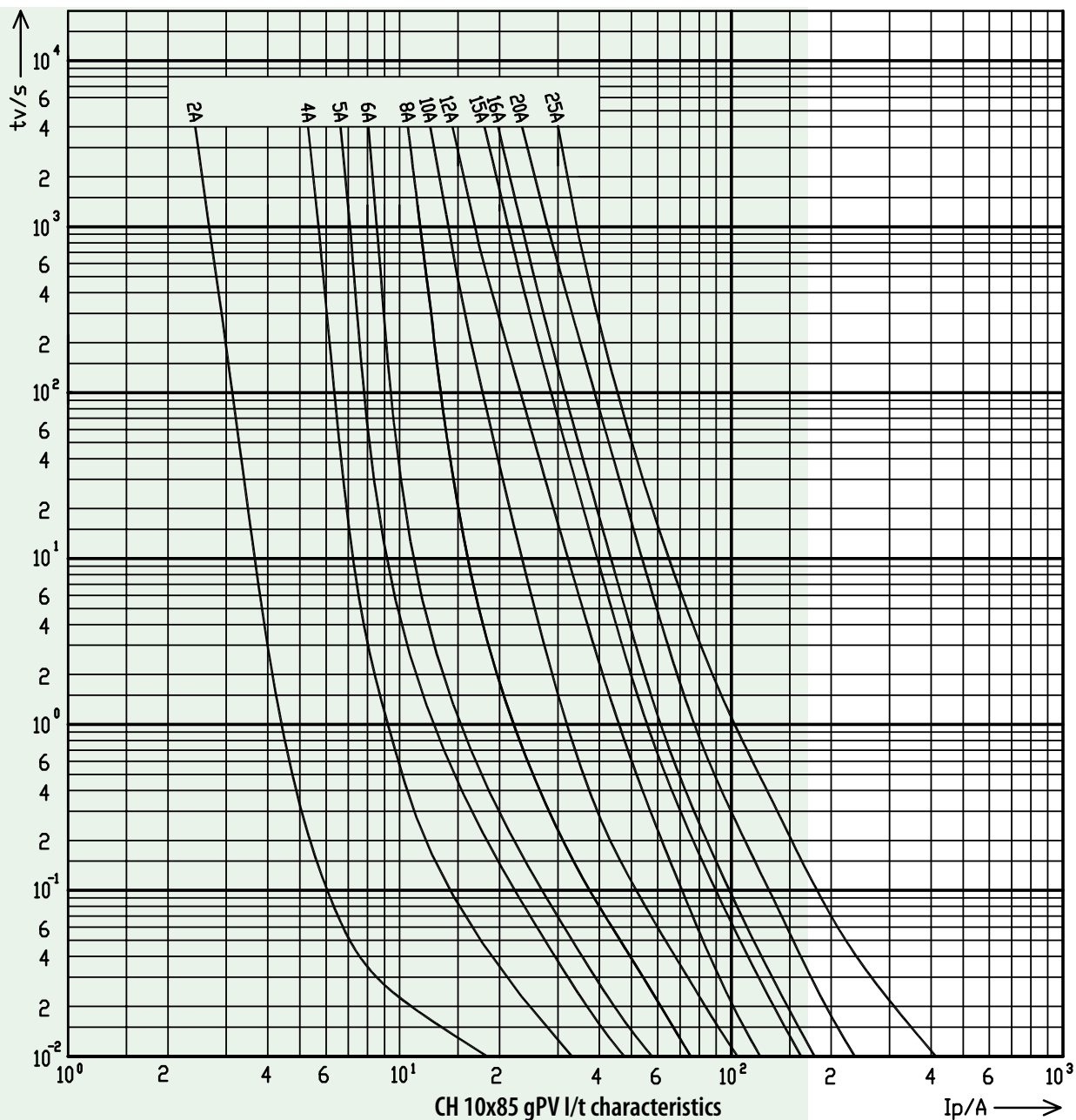
| | |
|-------------------|---|
| Rated voltage | 1500V d.c. L/R=2ms |
| Breaking capacity | 10kA d.c. / 30kA d.c. |
| Standards | UL 2579, UL 248-1 |
| Application | For protection of photovoltaic modules. |

CH 10x85 gPV

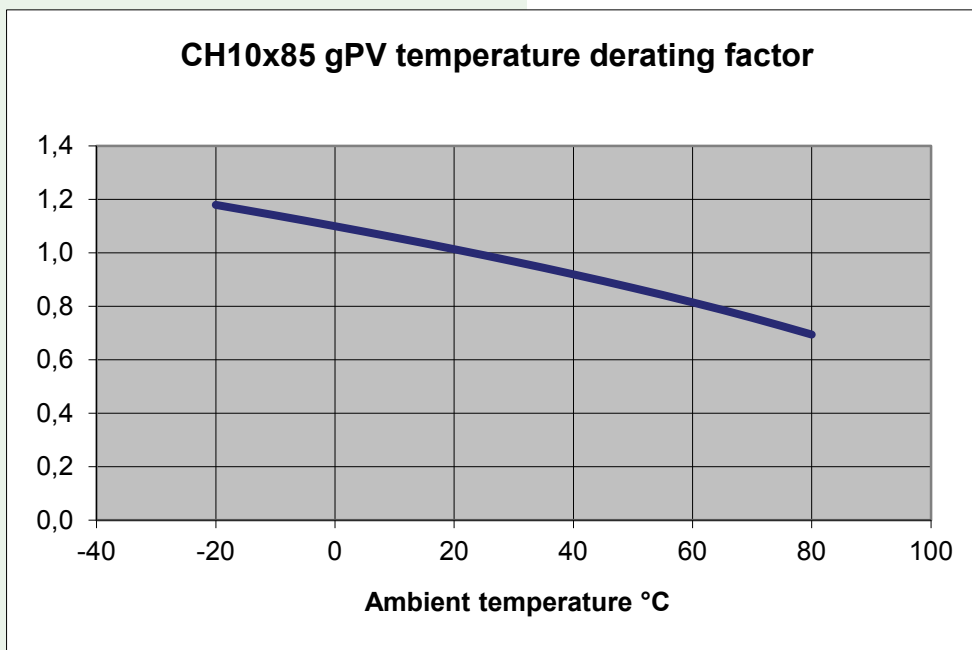
| Size | I_n [A] | Code No. "standard contacts" 10kA UL | Pre-arcing Joule integral [A ² s] L/R=1ms | Operating Joule integral [A ² s] L/R=1ms | Power dissipation [0,7 x I _n] ² P _d [W] | Power dissipation [I _n] ² P _d [W] | Weight [g] | Packaging [pcs] |
|---------|-----------|--------------------------------------|--|---|---|---|------------|---------------------|
| 10 x 85 | 2 | | 1,5 | 2,1 | 1,0 | 2,4 | 15/17 | 10/210 SU:10/160 |
| | 4 | 002625201 | 10,2 | 15,1 | 1,1 | 2,7 | | |
| | 5 | 002625239 | 10,6 | 33,2 | 1,2 | 3,0 | | |
| | 6 | 002625202 | 23,3 | 50,4 | 1,2 | 3,0 | | |
| | 8 | 002625203 | 46 | 109 | 1,5 | 3,6 | | |
| | 10 | 002625204 | 63 | 191 | 1,6 | 3,7 | | |
| | 12 | 002625205 | 24 | 118 | 1,4 | 3,3 | | |
| | 15 | 002625240 | 40,6 | 161 | 1,4 | 3,6 | | |
| | 16 | 002625206 | 35 | 164 | 1,6 | 3,7 | | |
| | 20* | 002625207 | 39 | 209 | 1,7 | 4,0 | | |
| 25* | 002625208 | 72 | 504 | 2,1 | 5,2 | | | |

* 1200V d.c.





| 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

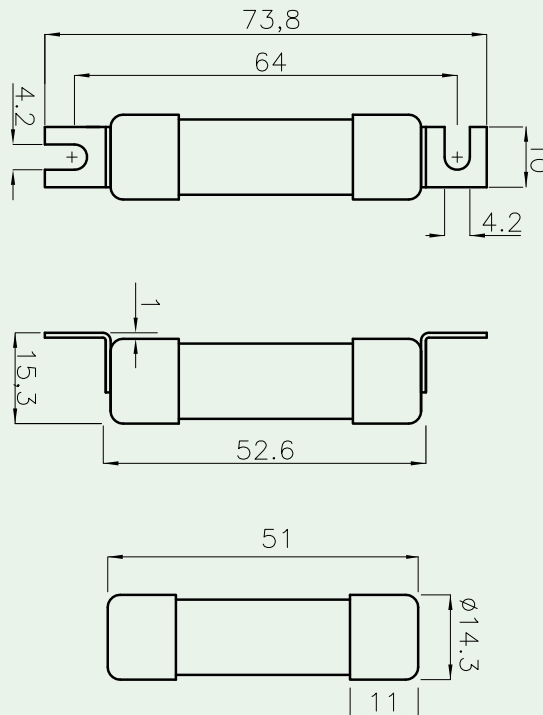
| Size | I_n [A] | Code No. "standard contacts" | Code No. "type SU contacts" | Pre-arcing Joule integral [A ² s] L/R=2ms | Operating Joule integral [A ² s] L/R=2ms | Power dissipation [0,7 x I _n] ² P _d [W] | Power dissipation [I _n] ² P _d [W] | Weight [g] | Packaging [pcs] |
|-------|-----------|------------------------------|-----------------------------|--|---|---|---|------------|-----------------|
| 14x51 | 15 | 002637140* | | 22 | 237 | 1,4 | 3,1 | 18,6 | 10/200 |
| | 15 | | 002637340* | 22 | 237 | 1,4 | 3,1 | 20,6 | 10/260 |
| | 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 |

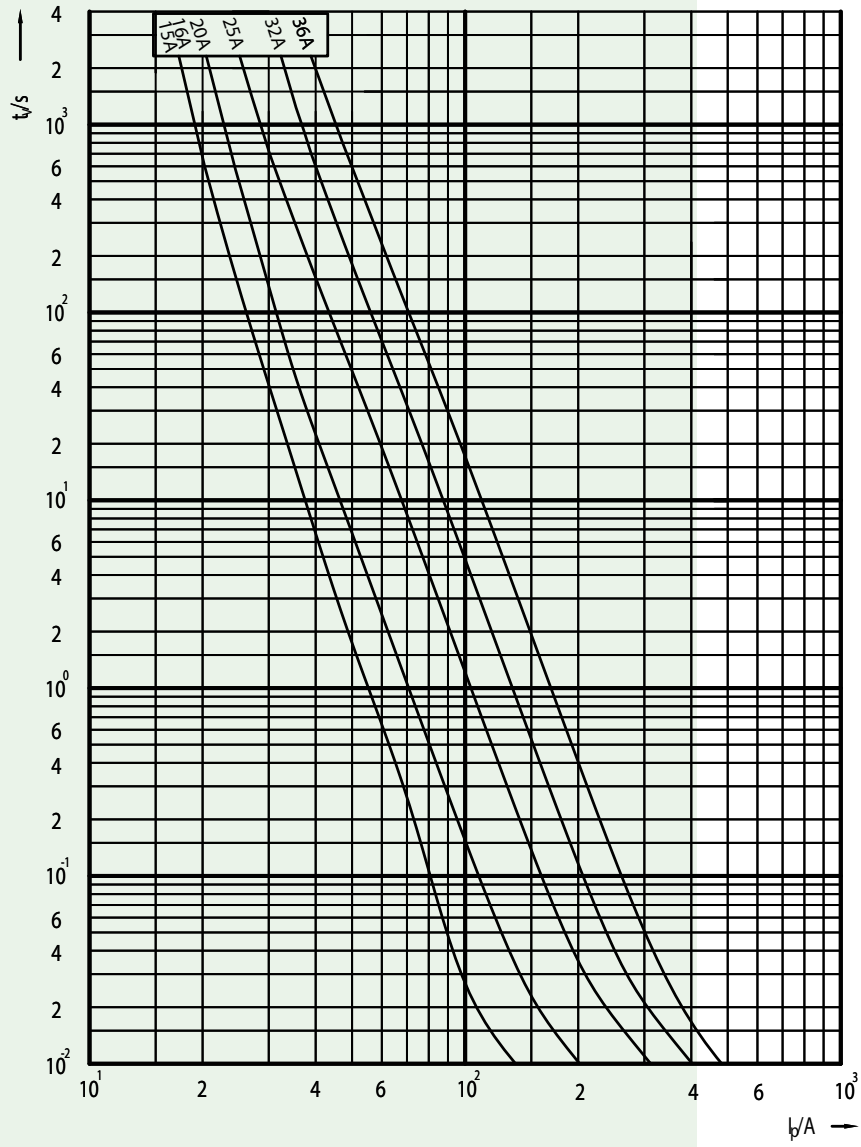
*Rated voltage: 1100V d.c. L/R=2ms
Breaking capacity: 30kA d.c.

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

NEW generation cylindrical gPV 1500V fuse-links

Features of cylindrical gPV 1500V fuse-links

We developed a new generation of PV cylindrical fuse-links with nominal currents up to 32A and rated voltage up to 1500V, with gPV characteristic for protecting solar panels against the reverse current. New fuse-links have a lower power dissipation and higher breaking capacity up to 50 kA. Size 10/14x85 has a patented design for interrupting in case of short circuit conditions. All current range of fuse-links can be mounted in EFH 10/14x85 fuse-holder.



→ silver plated contacts



→ All current range of fuse-links can be mount in EFH 10/14x85 fuse-holder.



→ pure silver fuse-element

→ up to 32 A

→ breaking capacity up to 50 kA

→ environment-friendly ceramic fuse-link body

→ lower power dissipation

→ patented design for interrupting in case of short circuit conditions

CH10x85 and CH10/14x85 gPV 1500V - Fuse-links

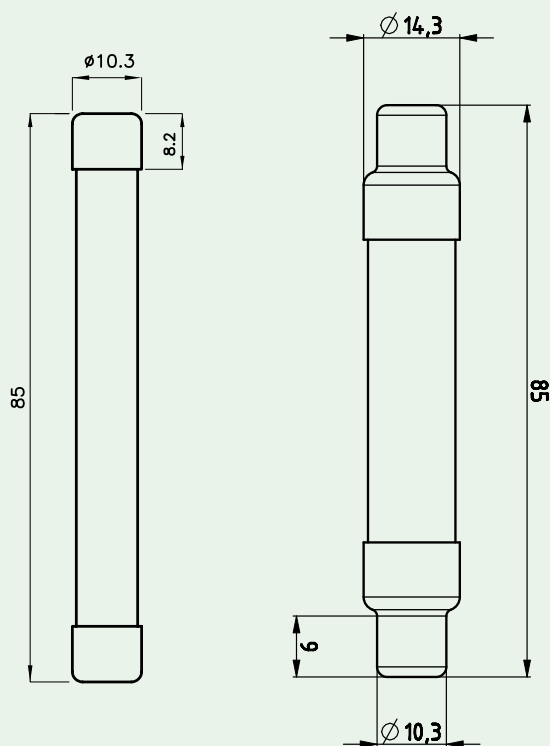
General characteristics

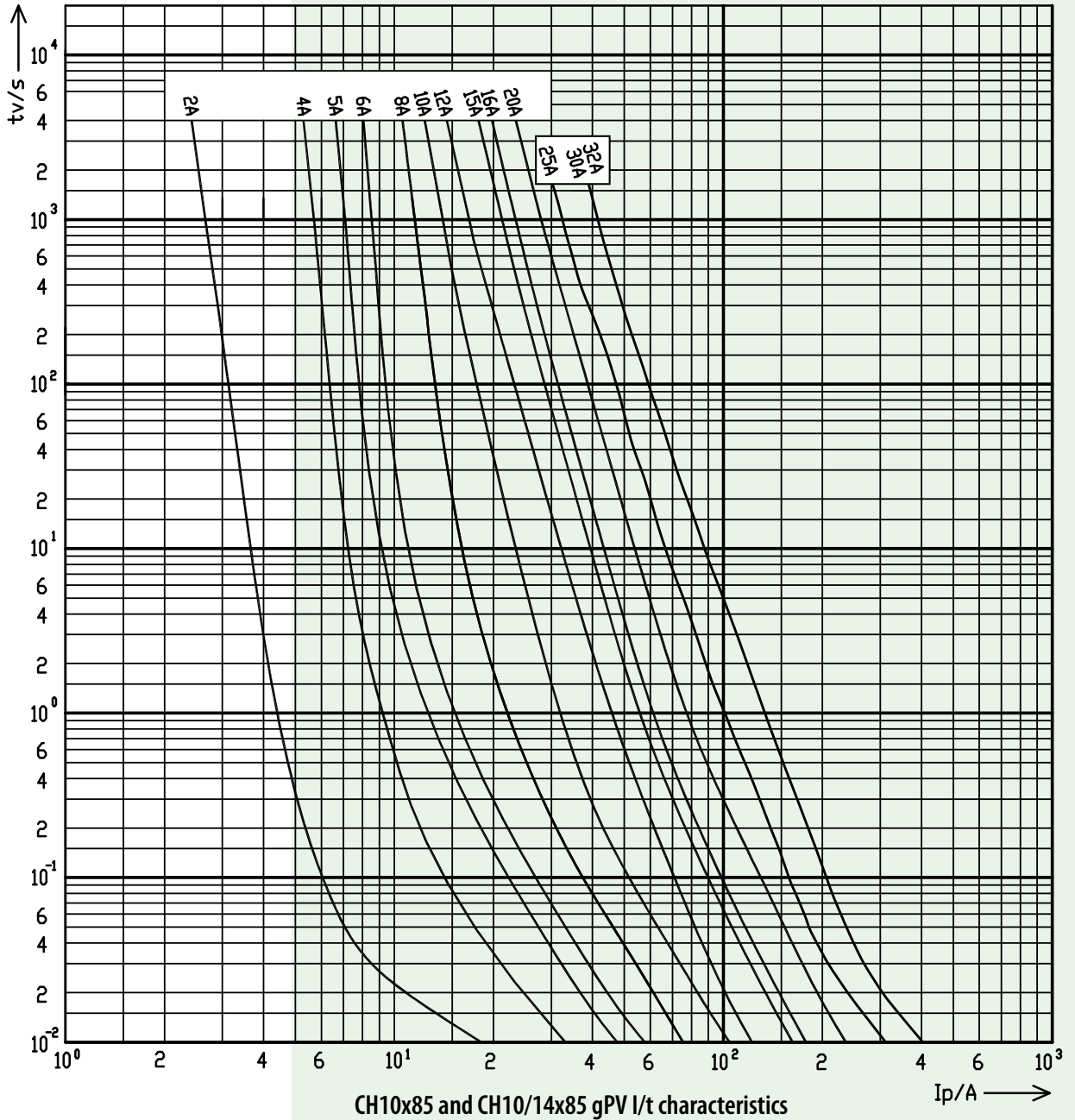
| | |
|-------------------|---|
| Rated voltage | 1500V d.c. L/R=2ms |
| Breaking capacity | 50kA d.c. |
| Standards | IEC 60269-6, UL (pending) |
| Application | For protection of photovoltaic modules. |



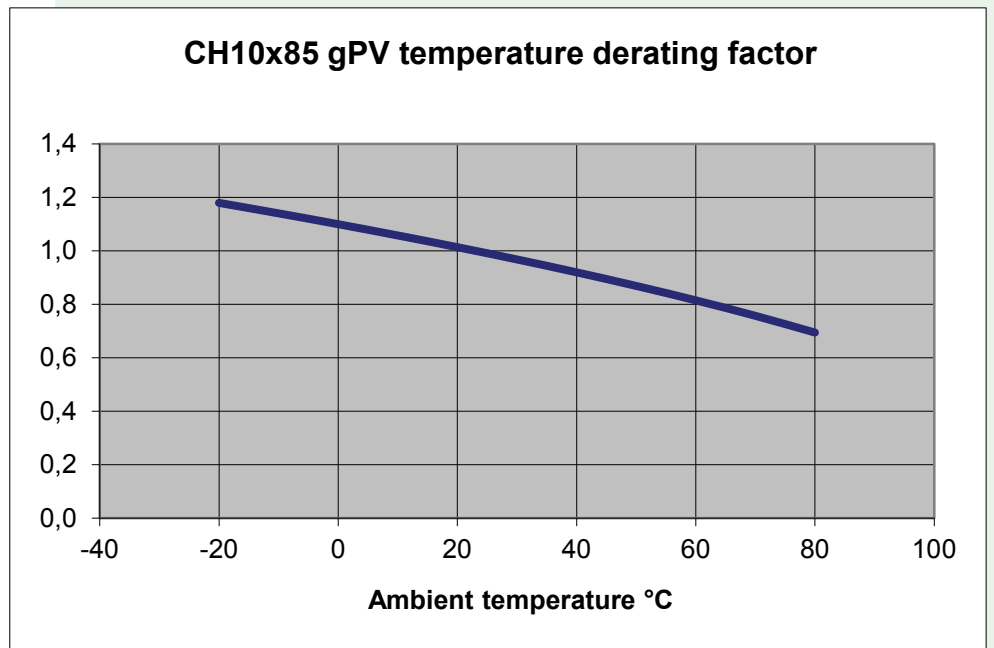
CH10x85 & CH10/14x85 gPV

| Size | I_n [A] | Code No. "standard contacts" | Code No. "type SU contacts" | Pre-arcing Joule integral [A ² s] L/R=2ms | Operating Joule integral [A ² s] L/R=2ms | Power dissipation [0,7 x I _n ²] P _d [W] | Power dissipation [I _n ²] P _d [W] | Weight [g] | Packaging [pcs] |
|------------|-----------|------------------------------|-----------------------------|--|---|---|---|------------|---------------------|
| 10 x 85 | 2 | 002625200 | 002625210 | 0,8 | 2,3 | 1,0 | 2,4 | 15/17 | 10/210 SU:10/160 |
| | 4 | 002625274 | 002625211 | 11,4 | 16,9 | 1,1 | 2,7 | | |
| | 5 | 002625276 | 002625209 | 7,0 | 25,9 | 1,2 | 3,0 | | |
| | 6 | 002625277 | 002625212 | 14,5 | 50,6 | 1,2 | 3,0 | | |
| | 8 | 002625279 | 002625213 | 36,1 | 106,9 | 1,5 | 3,6 | | |
| | 10 | 002625280 | 002625214 | 7,0 | 116,6 | 1,2 | 2,8 | | |
| | 12 | 002625282 | 002625215 | 10,3 | 152,0 | 1,4 | 3,3 | | |
| | 15 | 002625285 | 002625219 | 28,2 | 307,4 | 1,5 | 3,6 | | |
| | 16 | 002625286 | 002625216 | 34,2 | 352,1 | 1,5 | 3,6 | | |
| 10/14 x 85 | 20 | 002626234 | / | 48,4 | 462,2 | 2 | 4,8 | 28 | 10/230 |
| | 25 | 002626235 | / | 72,3 | 633,1 | 2,3 | 5,6 | | |
| | 30 | 002626236 | / | 143,8 | 959,2 | 2,6 | 6,4 | | |
| | 32 | 002626237 | / | 158,5 | 938,7 | 3,0 | 7,4 | | |





| 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 |



Advantages of photovoltaic fuseholder EFH

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



→ More space for finger to open fuse carrier



→ Complete protection against touch according to IP20



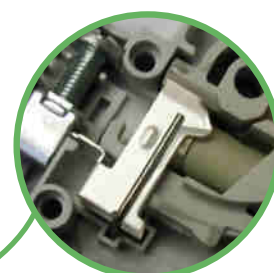
→ All plastic parts are made of material resistant to extremely high temperatures. Fuse carrier assures that a fuse link is not in touch with a housing

→ 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.



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

→ All contact surfaces are silver plated



→ Possibility of sealing in ON or OFF positions



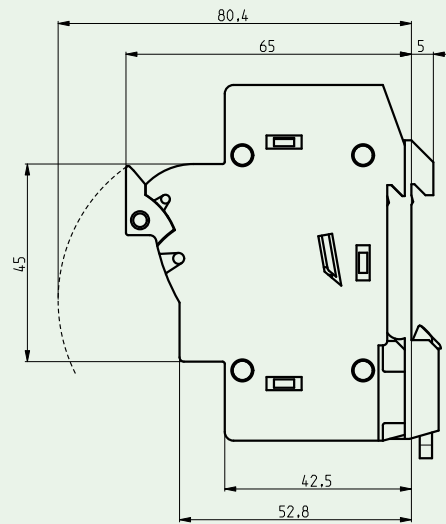
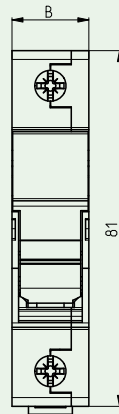
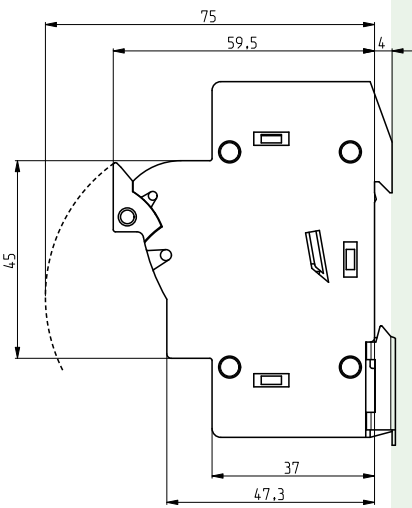
→ Modular design – it is possible to assemble multi-pole versions at the building site

EFH 10 DC - Photovoltaic fuseholder

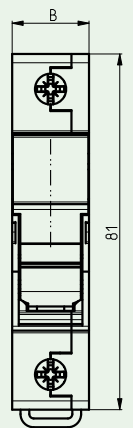


| General characteristics | |
|----------------------------------|---|
| Rated voltage | 1000V d.c. |
| Rated current | max. 25A |
| Max. fuse link power dissipation | 3 W |
| Cross section of connecting wire | 1 mm ² - 25 mm ² |
| Pole build-in width | 17,5 mm |
| Mounting on the rail | EN 60715 - 35mm 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_e/U_i [V] | I_{max} [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

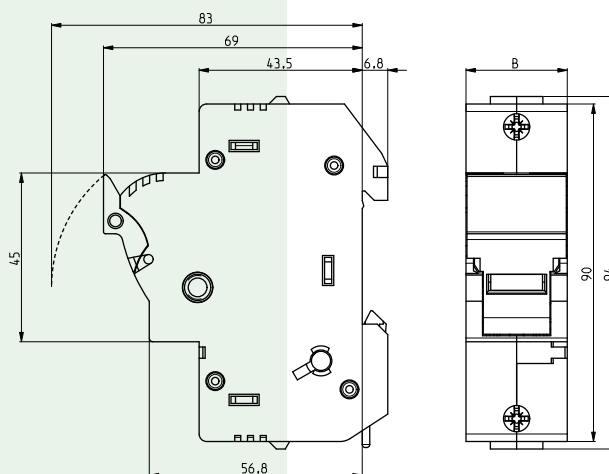
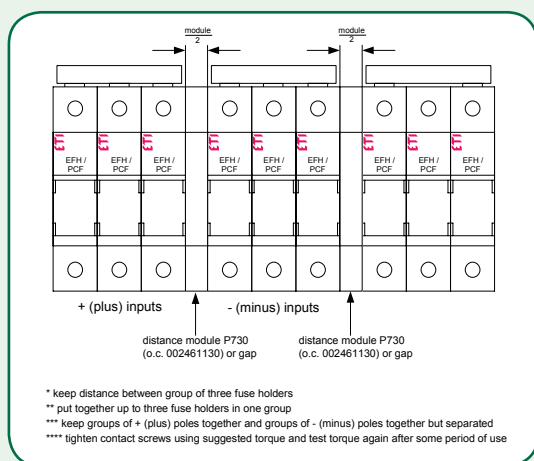
General characteristics

| | |
|----------------------------------|---|
| 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 ² - 35 mm ² |
| 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 _e /U _i [V] | I _{max} [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 |

EFH 22 DC - Photovoltaic fuseholder

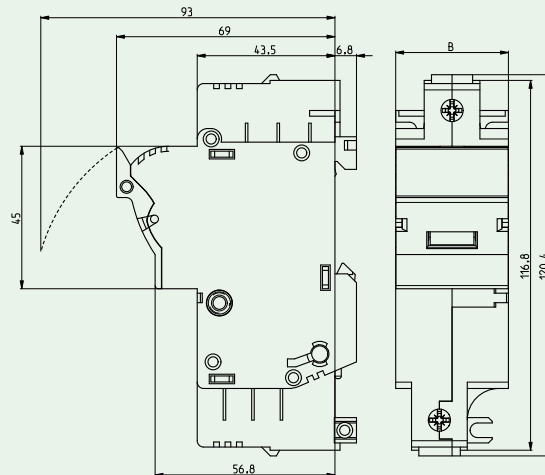


General characteristics

| | |
|----------------------------------|--|
| Rated voltage | 1000V d.c. |
| Rated current | 100A |
| Max. fuse link power dissipation | 9,5W |
| Cross section of connecting wire | 4 mm ² - 50 mm ² |
| Pole build-in width | 35,6 mm |
| Mounting on the rail | EN 60715 - 35mm rail or with screws |
| Utilization category | DC-20B (Do not operate under load) |
| Rated torque | 2,5-3 Nm |
| Standards Fuse-links | IEC/EN 60269-2, IEC/EN 60269-6 |
| Standards - Fuse holder | IEC 60947-1, IEC 60947-3 |

EFH 22 DC

| Number of poles | U_e/U_i [V] | I_{max} [A] | Code No. | Indicator | Weight [g] | Packaging [pcs] |
|-----------------|---------------|---------------|-----------|-----------|------------|-----------------|
| 1 p | 1000V d.c. | 100A | 002570201 | - | 156 | 3/105 |
| | | | 002570211 | LED | 158 | |
| 2 p | | 100A | 002570203 | - | 317 | 2/34 |
| | | | 002570213 | LED | 321 | |



| Type | Dimensions [mm] |
|--------|-----------------|
| | B |
| 1 pole | 35,6 |
| 2 pole | 71,2 |

Technical specifications for photovoltaic fuseholder

| Technical data | | | | | |
|---|--|---|--|---|----------------------------------|
| | EFH 10 DC | | EFH 14 DC | | EFH 22 DC |
| Fuse type | CH 10x38 PV | | CH 14x51 PV | | CH 22x58 PV |
| | IEC | UL | IEC | UL | IEC |
| Versions | Without indicator, LED indicator | | | | |
| Number of poles | 1p, 2p | | | | |
| Rated operational voltage Ue | 1000V d.c. | | | | |
| Rated operational current Ie | 25A | | 50A | | 100A |
| Rated conditional short-circuit current | 30kA | 10kA | 30kA | 10kA | 30kA |
| Rated insulation voltage Ui | 1000V | | 1000V | | 1000V |
| Rated imp. withstand voltage Uimp | 8kV | | 8kV | | 8kV |
| Required insulation temperature rating | 60°C | | 60°C | | |
| Max power dissipation of the fuse-link (W) | 3W | | 5W | | 9,5W |
| 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 | | 0 |
| Operational performance (cycles without current) | 2000 | | 2000 | | 2000 |
| Inclined Plane Tracking (IPT) | 60min at 1kV | | 60min at 1kV | | |
| Humidity | 90% at 20°C | | 90% at 20°C | | 90% at 20°C |
| Operating ambient temperature | -5°C ... +40°C | | -5°C ... +40°C | | -5°C ... +40°C |
| Store ambient temperature | -25°C ... +55°C | | -25°C ... +55°C | | -25°C ... +55°C |
| Degree of protection (IEC 60529) | IP 20 | | IP 20 | | IP 20 |
| Terminal capacity | 1-25mm ² | AWG 18-8 solid&stranded Cu only | 1,5-35mm ² | AWG 16-6 solid&stranded Cu only | 4-50mm ² |
| Screw | PZ M5 | PZ M5 | PZ M5 | PZ M5 | PZ M5 |
| Torque | 2Nm | 2Nm 17,7 lb-in | 2,5-3Nm | 2Nm 17,7 lb-in | 2,5-3Nm |
| 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 | IEC/EN 60269-2 IEC/EN 60269-6 |
| 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 | IEC 60947-1 IEC 60947-3 |
| Test reports | Int | | Int | | Int |
| Certificates | UL Listed | | UL Listed | | UL Listed |

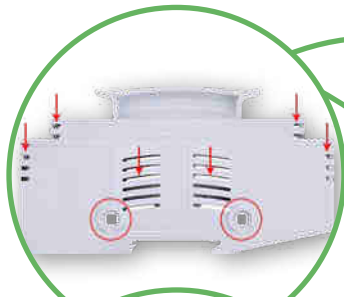
NEW EFH 10/14x85 PV fuseholder

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.

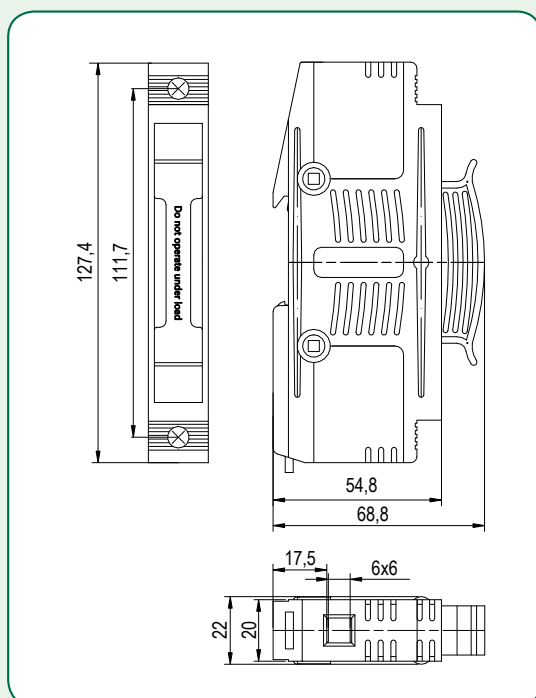


General characteristics

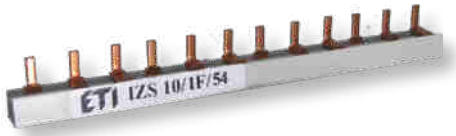
| | |
|--------------------------------------|---|
| Rated operational current Ie | 32A |
| Rated operational voltage Ue | 1500 V d.c. |
| Rated insulating voltage Ui | 1500 V d.c. |
| Max. power dissipation | 6,5 W |
| Rated impulse withstand voltage Uimp | 8kV |
| Conditional short-circuit current | 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 ² |
| 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 _{max} [A] | U _e /U _i [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

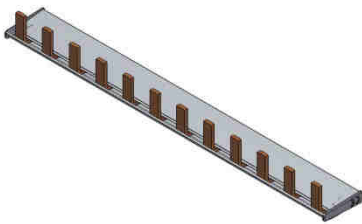
| Type | Description | Code No. | Cross section (mm ²) | Length (m) | Weight [g] | Packaging [pcs] |
|-------------|-------------------------------------|-----------|----------------------------------|------------|------------|-----------------|
| IZS10/1F/54 | 10 mm ² , 1 pole, 54 mod | 002921101 |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

For use with EFH10 DC, more info in B&I catalogue

EFH 14 DC

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

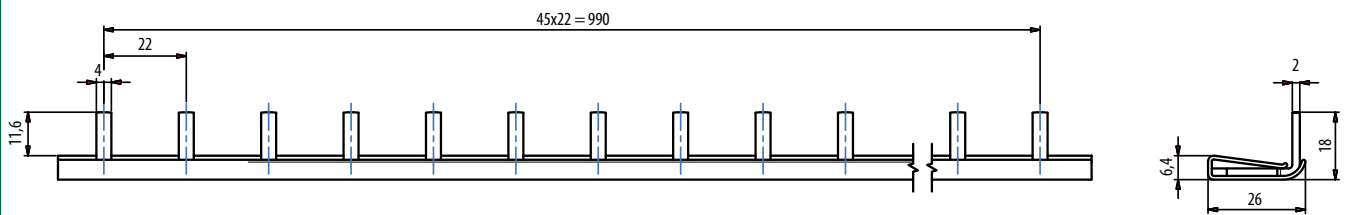
For use with EFH14 DC, more info in B&I catalogue



EFH 10/14x85 DC

| Type | Description | Code No. | Cross section (mm ²) | Length (m) | Weight [g] | Packaging [pcs] |
|------------|--|-----------|----------------------------------|------------|------------|-----------------|
| IZ35/1F/46 | 35mm ² , 1 pole, 46 mod, T=22mm, 1500 VDC, 125A | 002921292 | 35 | 1,016 | 400 | 10 |

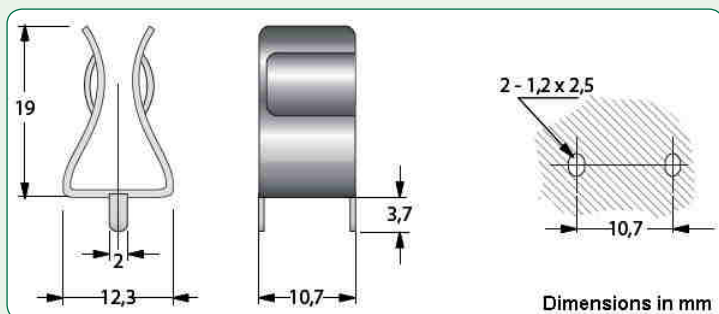
Use end cover Z-50/1F/28 (002921263), under 1 reference code = 1 pair
Feeding at beginning/ending rail = 125A, feeding in middle of rail = 200A



Fuseholder for CH fuse links

Fuseholders for CH10 fuse links

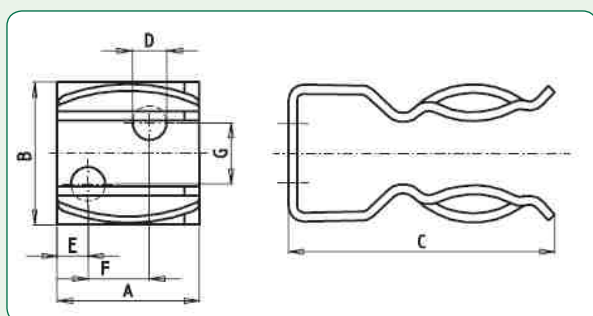
| Code | Type | Weight(g) | Packaging [pcs] |
|-----------|---------|-----------|-----------------|
| 006710335 | HK10383 | 1 | 250 |



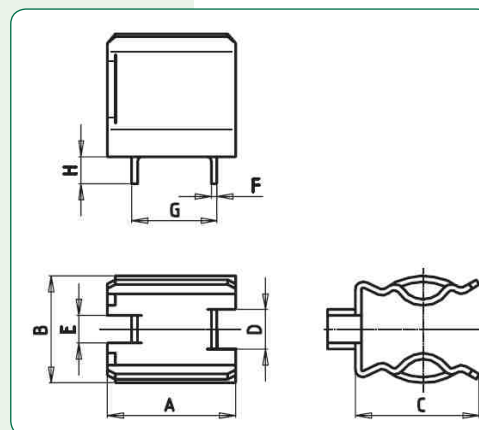
| Type | Dimensions [mm] | | | | | | | |
|---------|-----------------|-----|------|-----|-----|------|------|-----|
| | A | B | C | D | E | F | G | H |
| HK10383 | 12,3 | 9,8 | 19,0 | 2,0 | 2,0 | 0,75 | 11,0 | 4,0 |

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



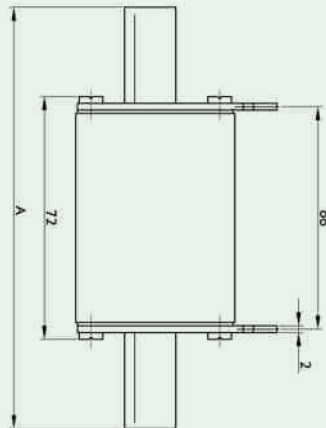
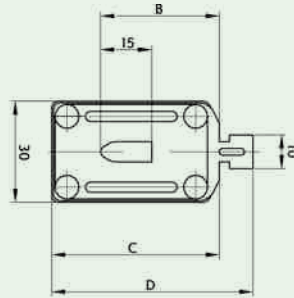
General characteristics

| | |
|-------------------|--|
| 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 [I²t] (L/R = 15ms) | Operating Joule integral [I²t] (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 | 3/45 |
| 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

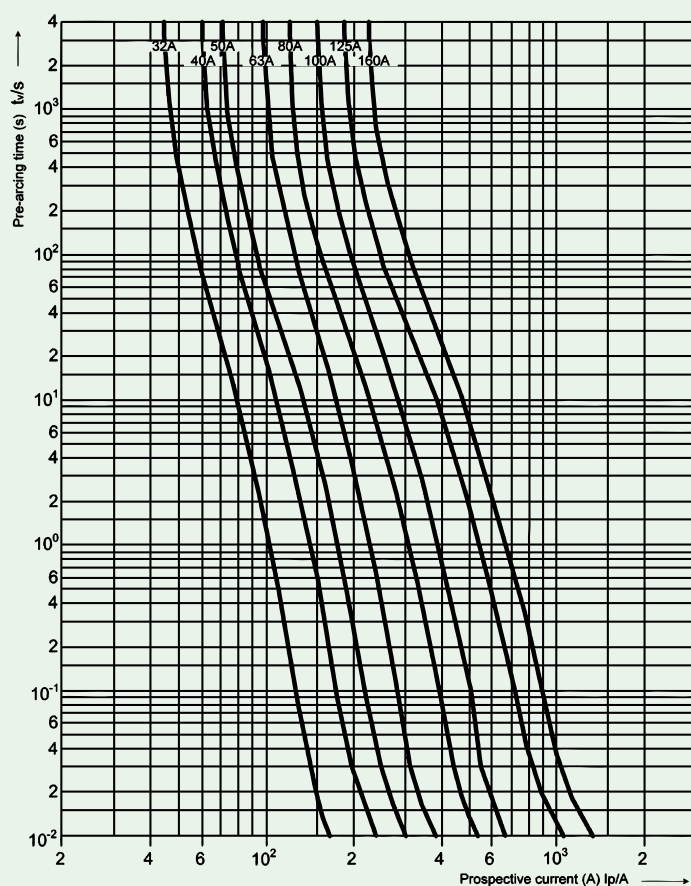
General characteristics

| | |
|----------------------|--|
| 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_n [A] | gPV | | Power dissipation [W] | Pre-arcing Joule integral [I ² t] (L/R = 2ms) | Operating Joule integral [I ² 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 | 3/45 |
| 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

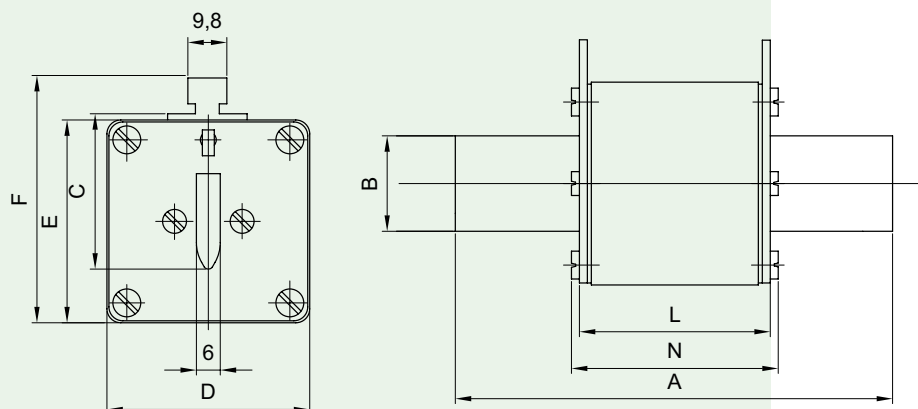
| | |
|-------------------|--|
| Rated voltage | 1000V d.c. (L/R=1ms) |
| Breaking capacity | 30kA d.c. |
| Standards | IEC 60269-6 ed. 1.0 |
| Application | Fuse link for DC application. Applied in fuse base PK1, 2, 3 1000V d.c.. |

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 ² t] (L/R = 1ms) | Operating Joule integral [I ² t] (L/R = 1ms) | Weight [g] | Packaging [pcs] |
|------|-----------|---------------------------------------|--|--|--|--|-----------------------|--|---|------------|------------------------------|
| 1 | 200 | 004110342 | | | | 11 | 27 | 4.400 | 29.000 | 500 | 3/24 |
| | 250 | 004110344 | 004110293 | 004110297 | 004110347 | 15 | 36 | 6.000 | 38.000 | 650 | 1/16 (G screw contact: 2/32) |
| 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 | | |



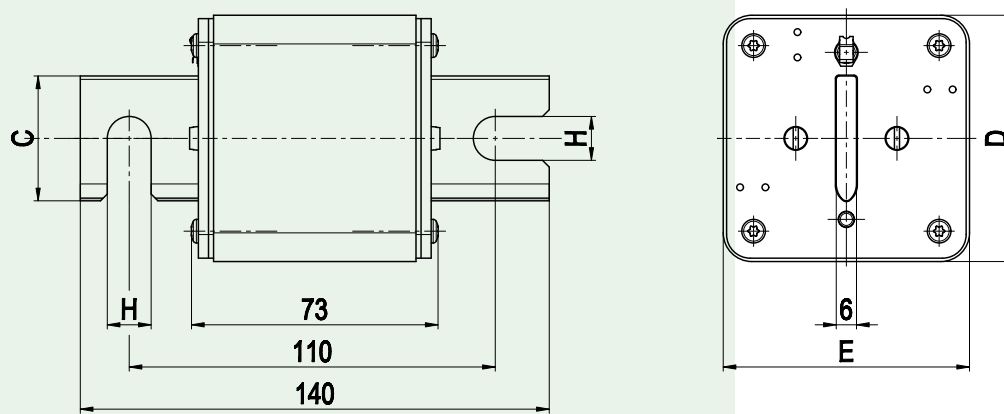
Pic.1



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 |

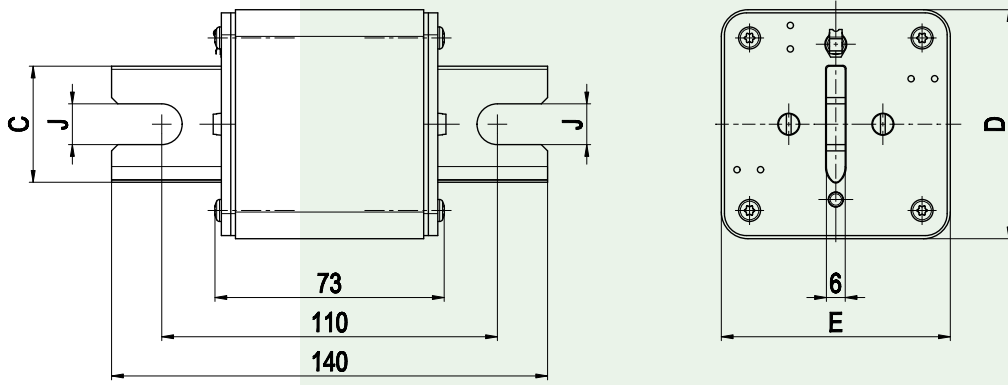
Pic.2



S₁₁₀ screw contact

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

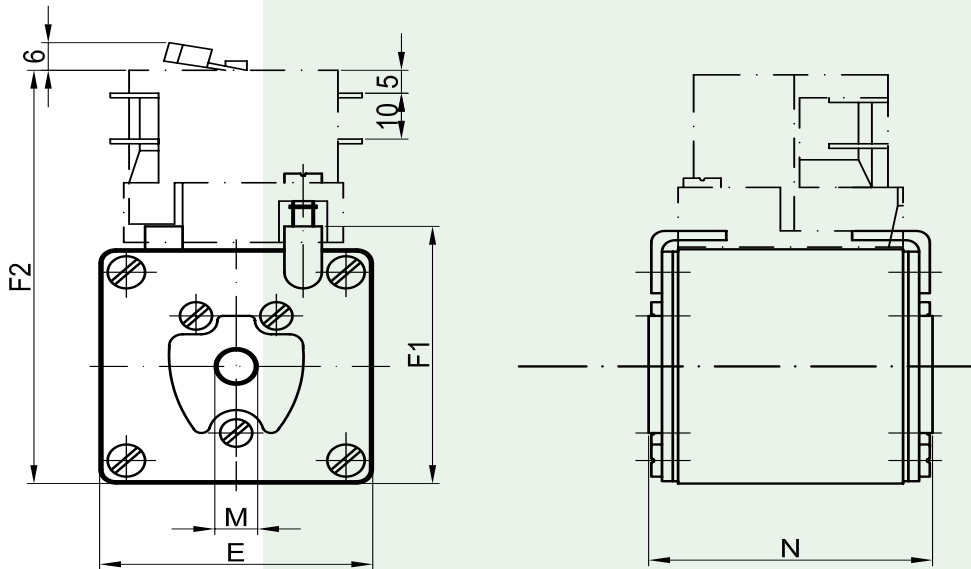
Pic.3



U₁₁₀ screw contact

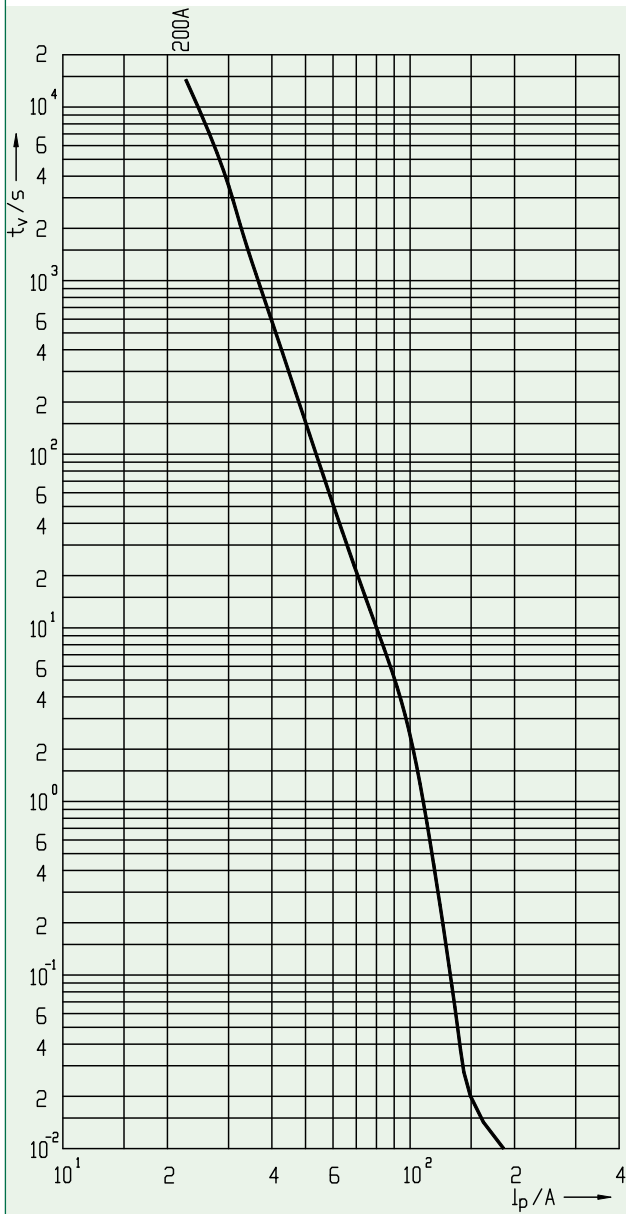
| Size | C | J | E | D |
|------|----|----|----|----|
| 2 | 30 | 13 | 60 | 60 |
| 3 | 37 | 13 | 73 | 73 |

Pic.4

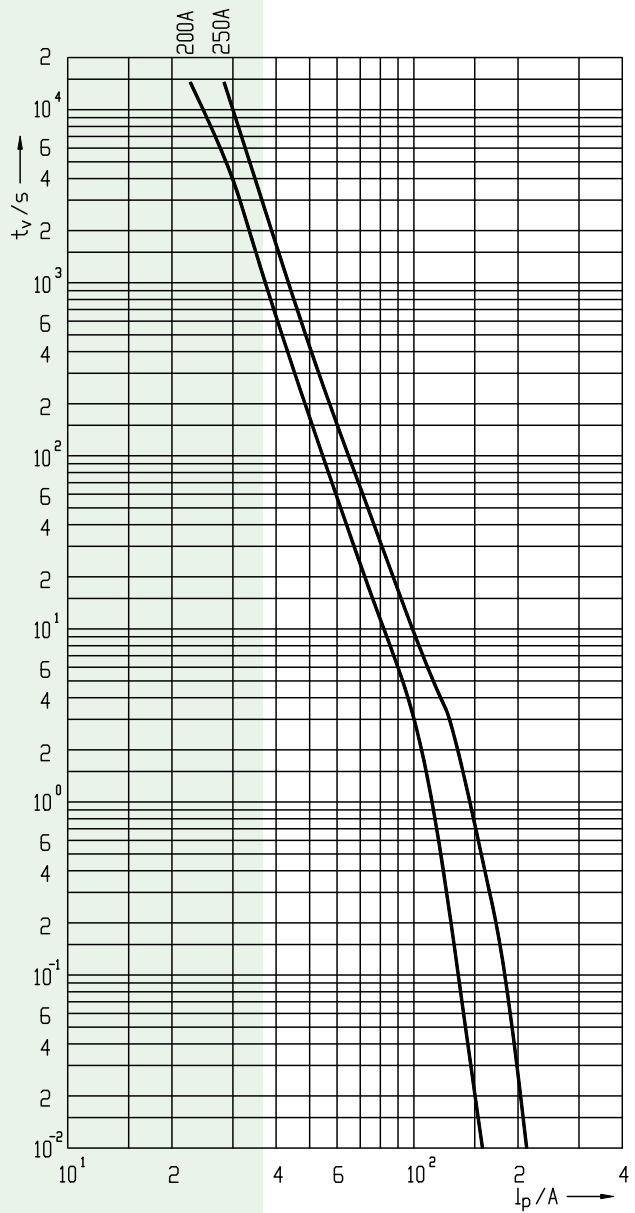


G screw contact

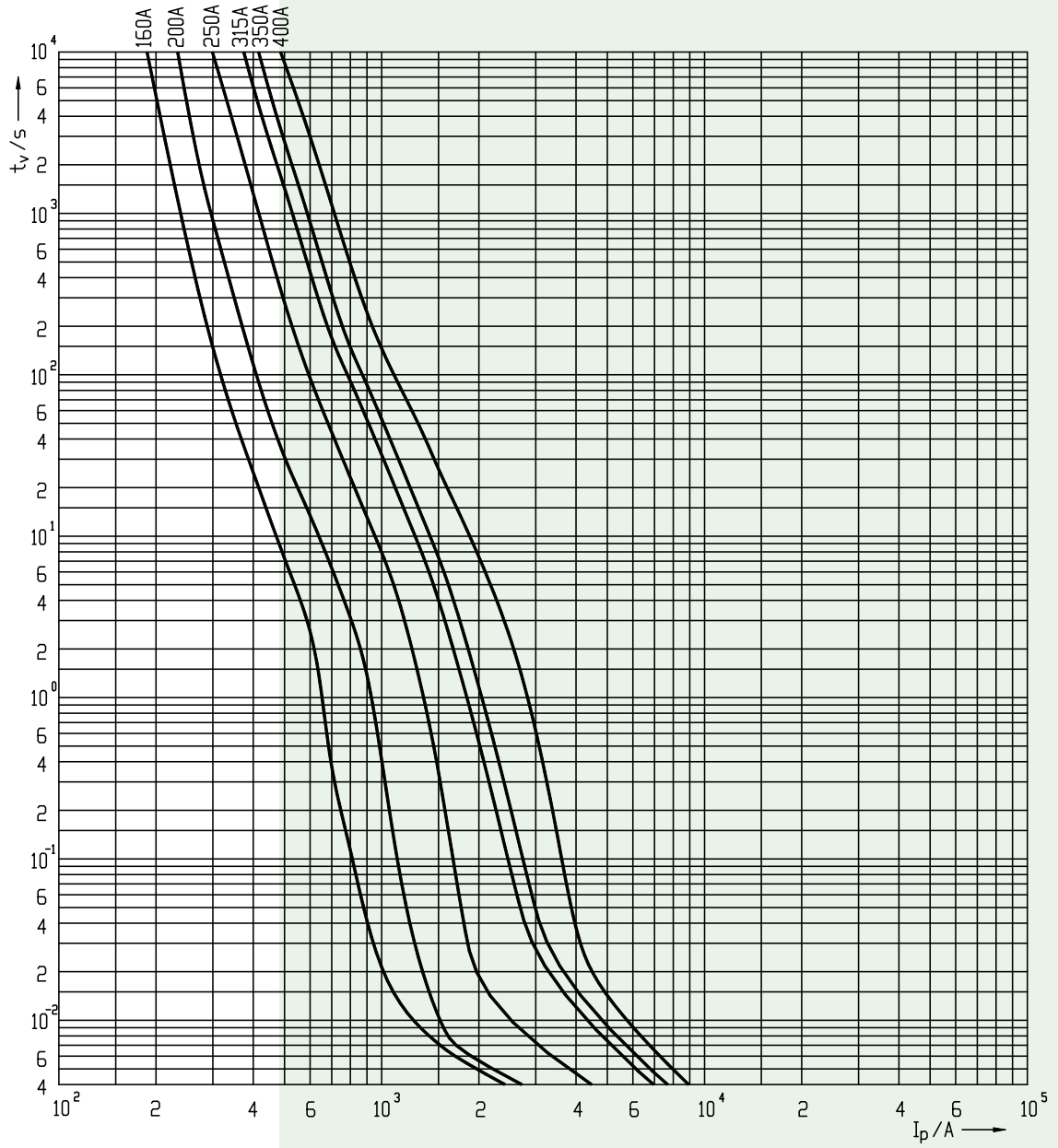
| Size | D | E | F1 | F2 | M | N |
|------|----|----|----|-----|-----|----|
| 2 | 60 | 60 | 65 | 99 | M10 | 75 |
| 3 | 75 | 75 | 80 | 114 | M12 | 75 |



**NH1 gPV
1000V t-I
characteristics**



**NH2 gPV
1000V t-I
characteristics**



NH3 gPV 1000V t-I characteristics

NH DC 1000V - Fuse-links

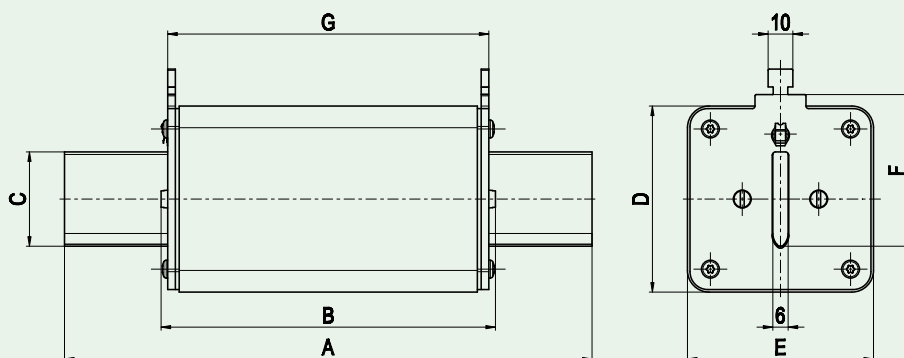
General characteristics

| | |
|-------------------|--|
| 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 |

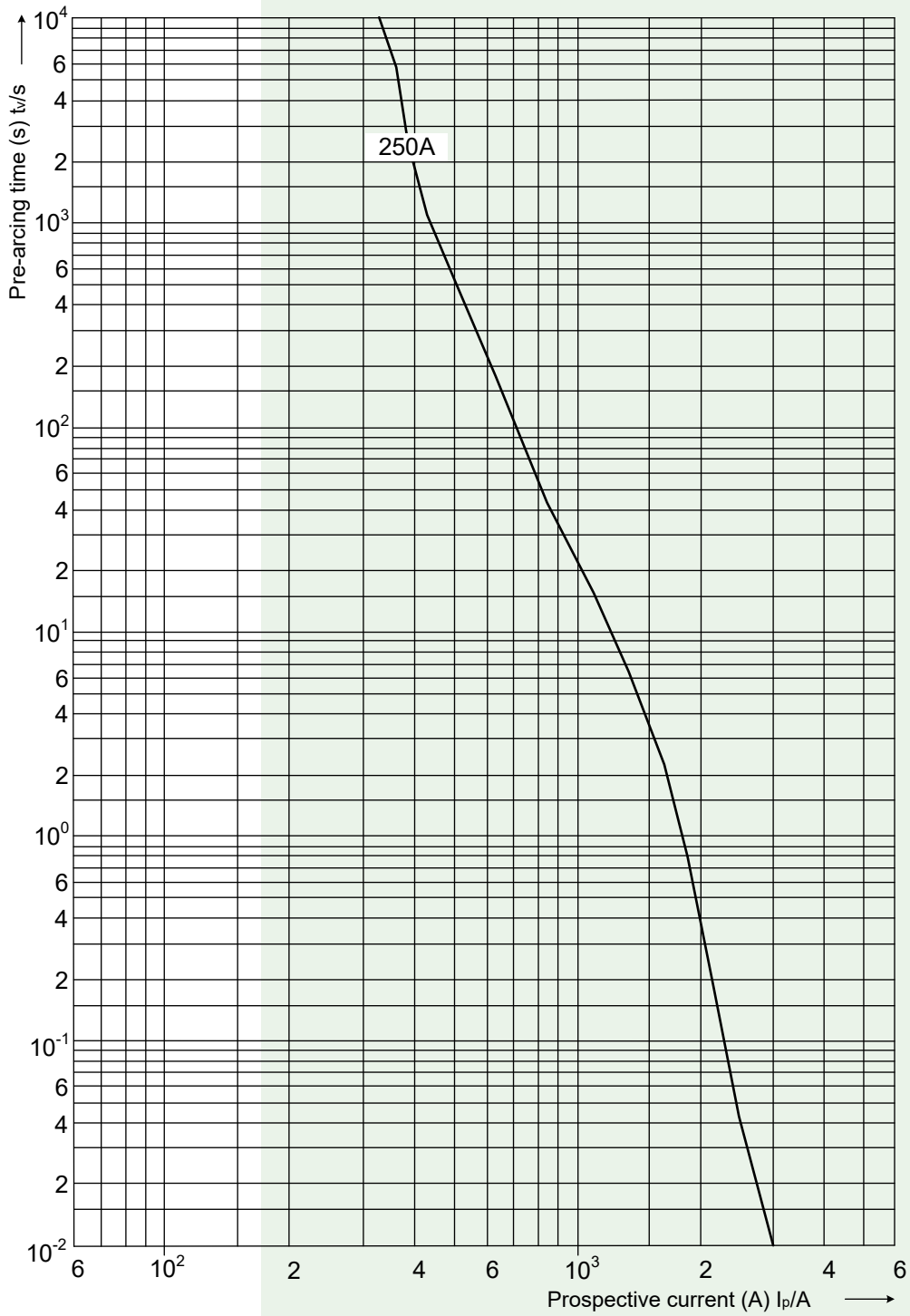


DC 1000V gPV

| 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. |

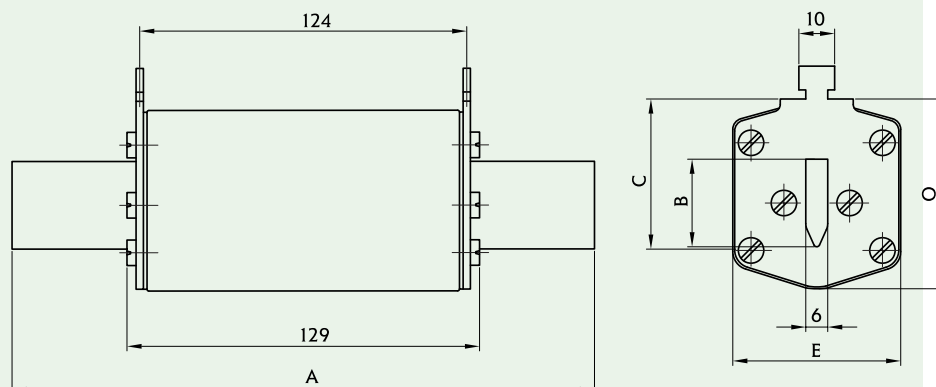


DC 1100V

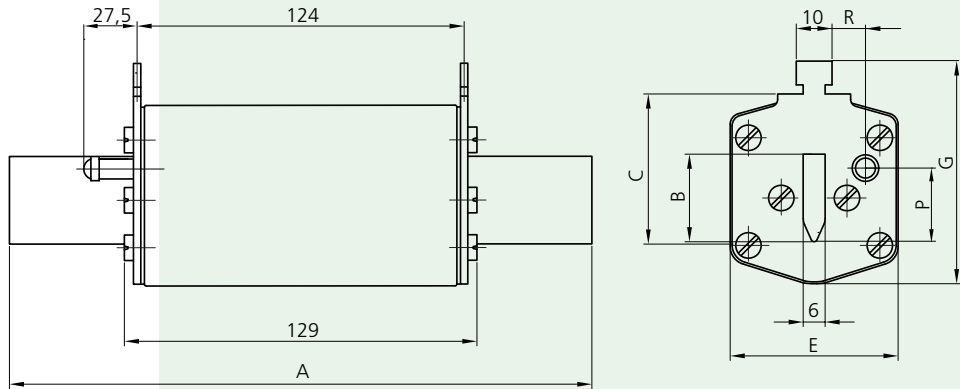
| Size | I_n [A] | Standard indicator (pic.1) | Trip indicator - K (pic.2) | S_{170} screw contact (pic.3) | Power dissipation (0,7xI _n) P_d [W] | Power dissipation [W] | Pre-arcing Joule integral [I ² t] (L/R = 5ms) | Operating Joule integral [I ² t] (L/R = 5ms) | Weight [g] | Packaging [pcs] |
|------|-----------|----------------------------|----------------------------|---------------------------------|--|-----------------------|--|---|------------|-----------------|
| 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)

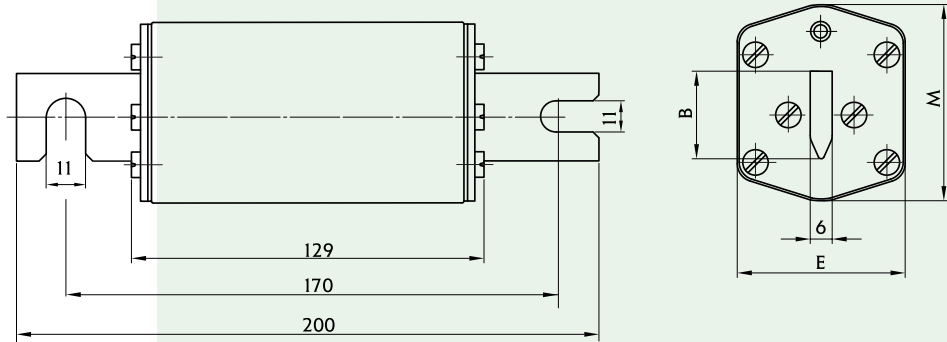
Picture 1



Picture 2

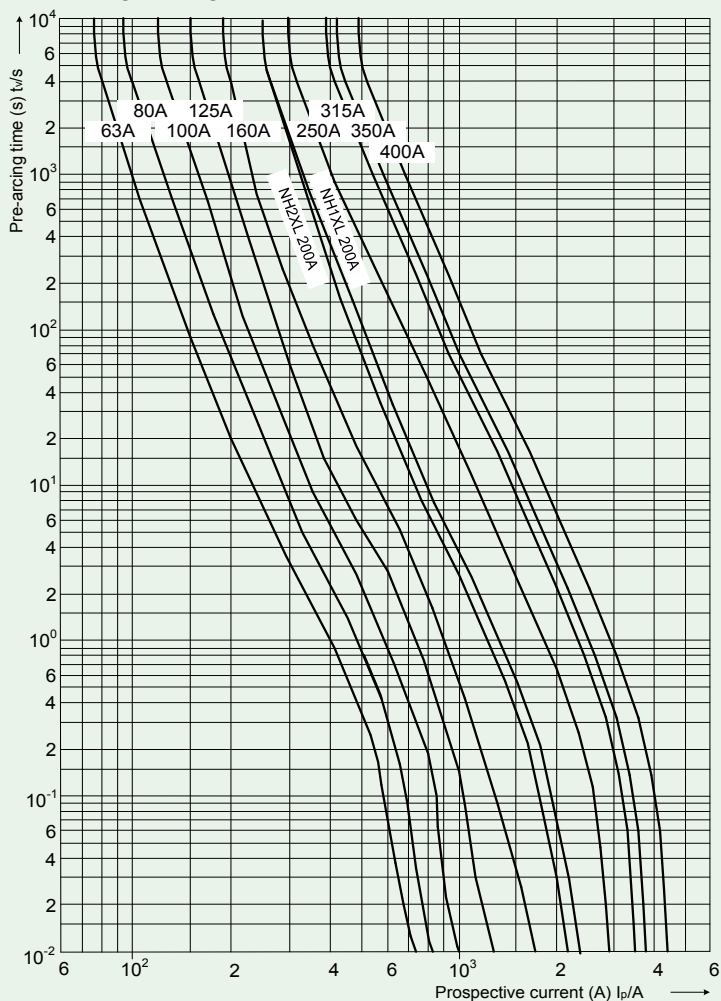


Picture 3

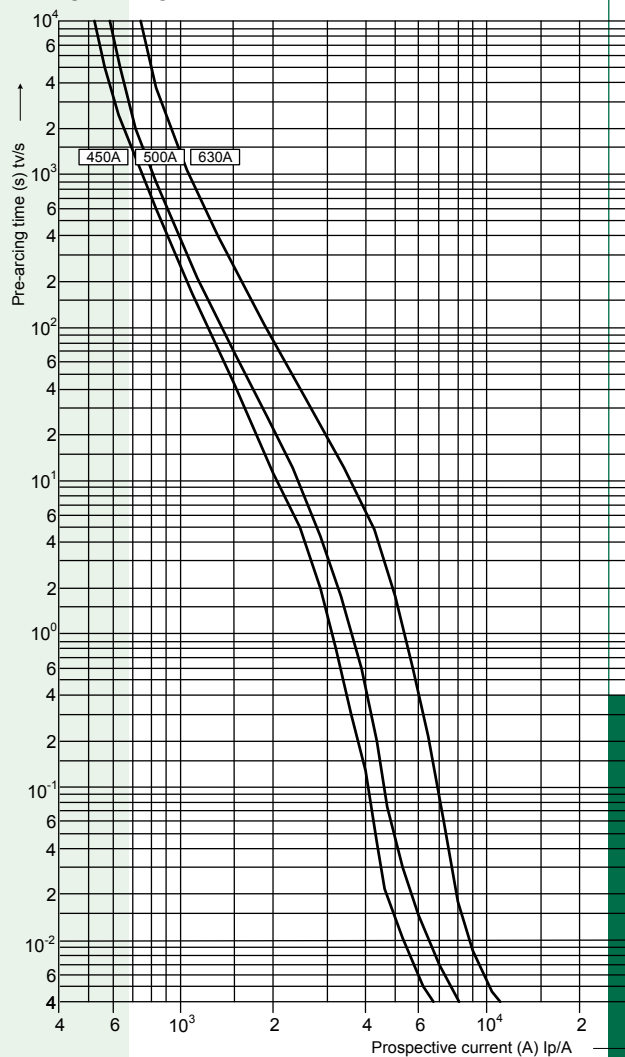


| Size | Dimensions [mm] | | | | | | | | |
|------------------------|-----------------|----|----|----|------|------|------|----|----|
| | A | B | C | E | G | P | R | M | O |
| 1XL | 194 | 24 | 40 | 46 | 61,5 | 20,5 | 13,7 | 50 | 52 |
| 2XL | 209 | 30 | 48 | 54 | 71 | 27,3 | 16,2 | 59 | 61 |
| *2XL (350A) | 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

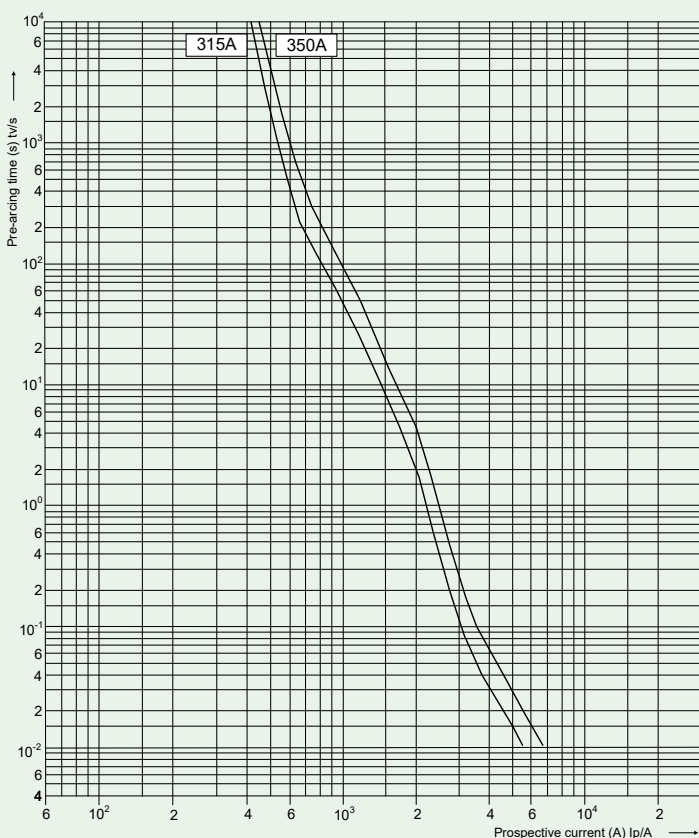


gPV, PV(gR) 1100V t-I characteristics



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. | |

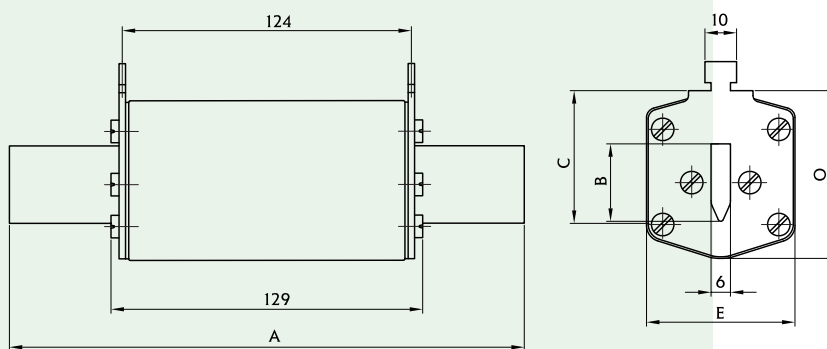
DC 1100V gPV

| Size | I _n [A] | gPV | | | Power dissipation (0,7xI _n) P _d [W] | Power dissipation [W] | Pre-arcing Joule integral [I ² t] (L/R = 2ms) | Operating Joule integral [I ² t] (L/R = 2ms) | Weight [g] | Packaging [pcs] |
|------|--------------------|----------------------------|--|--|--|-----------------------|--|---|------------|-----------------|
| | | Standard indicator (pic.1) | S ₁₇₀ screw contact (pic.2) | U ₁₇₀ screw contact (pic.3) | | | | | | |
| 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 | | |
| | 200 | 004110396 | 004110477 | 004110492 | 15 | 34,8 | 39.000 | 80.000 | | |
| 2XL | 200 | 004110397 | 004110478 | 004110493 | 15,9 | 36 | 55.000 | 75.000 | 1050 | 1/15 |
| | 250 | 004110398 | 004110479 | 004110494 | 19,3 | 44 | 90.000 | 120.000 | | |
| 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 | | |

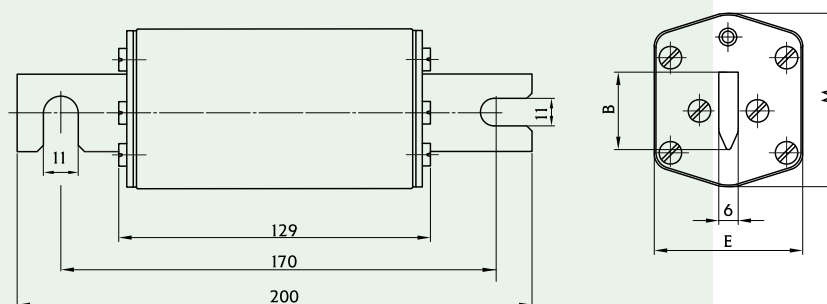
*size 73x73; dimensions on page 46 (3L).



Picture 1

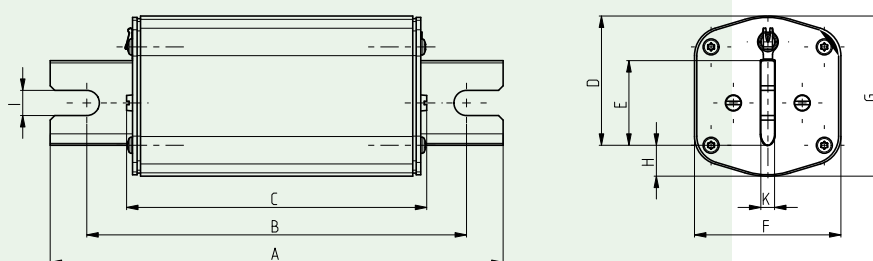


Picture 2

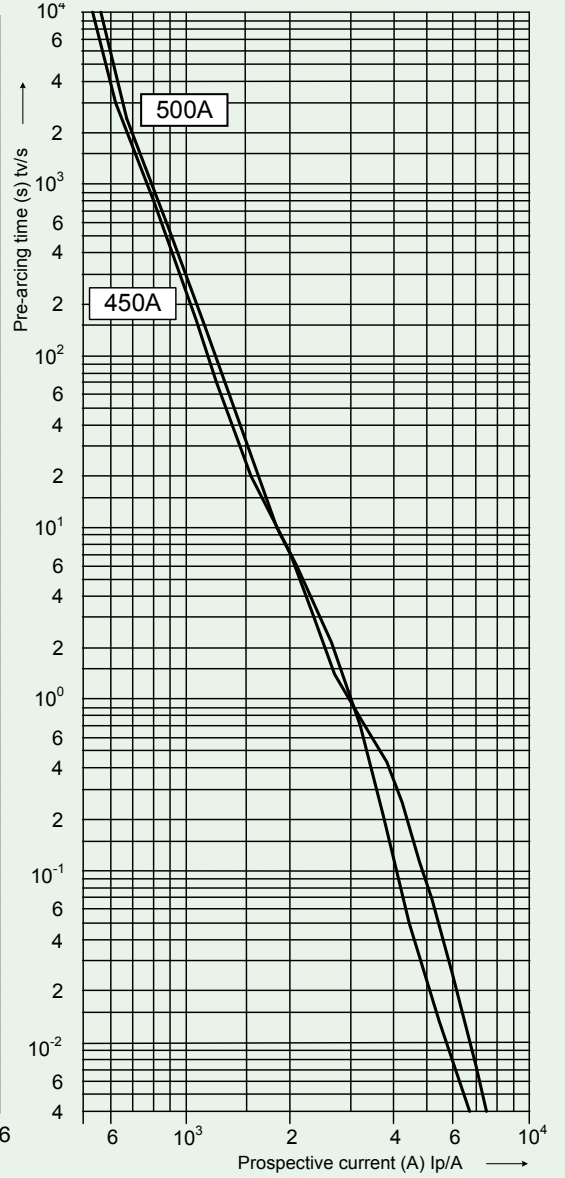
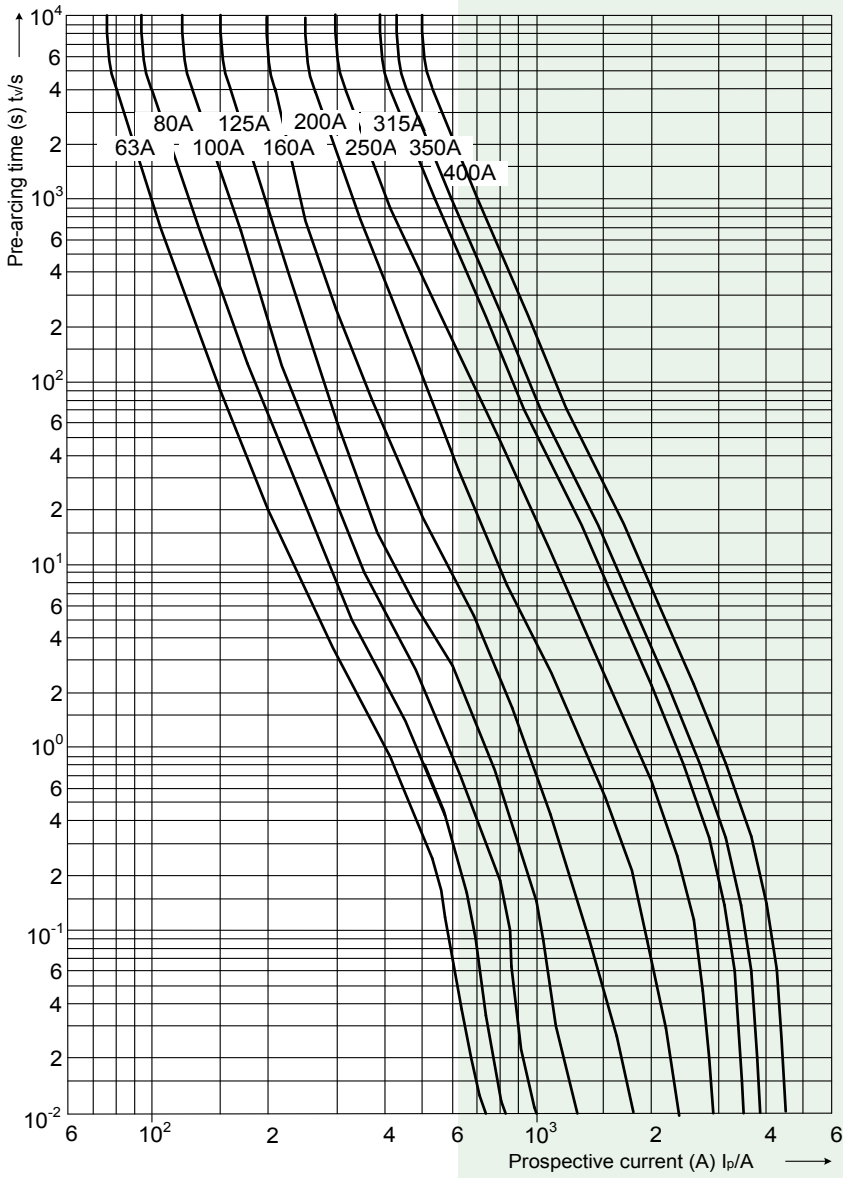


| Size | Dimensions [mm] | | | | | | | | |
|------|-----------------|----|----|----|------|------|------|----|----|
| | A | B | C | E | G | P | R | M | O |
| 1XL | 194 | 24 | 40 | 46 | 61,5 | 20,5 | 13,7 | 50 | 52 |
| 2XL | 209 | 30 | 48 | 54 | 71 | 27,3 | 16,2 | 59 | 61 |
| 3L | 209 | 37 | 60 | 64 |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

Picture 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-l characteristics

NEW!

NH 01 XL DC 1500V - Fuse-links

General characteristics

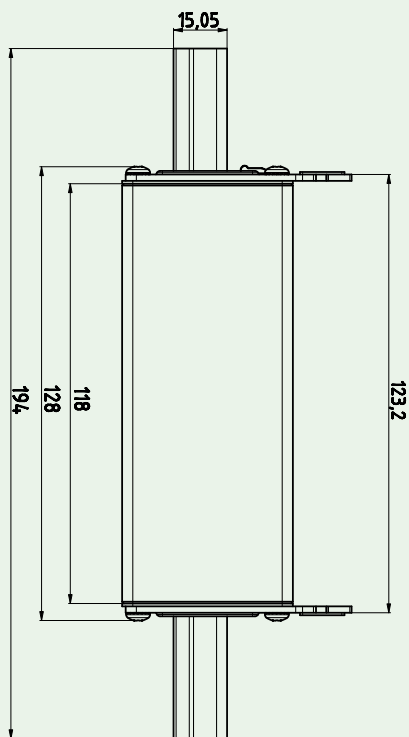
| | |
|-------------------|---|
| Rated voltage | 1500V d.c. (L/R=3ms) |
| Breaking capacity | 30kA d.c. |
| Standards | IEC 60269-6, UL248-19 |
| Application | Fuse link for DC application. Applied in fuse base PK1XL. |

EU patent
EP 3 210 231
by
European
Patent
Office

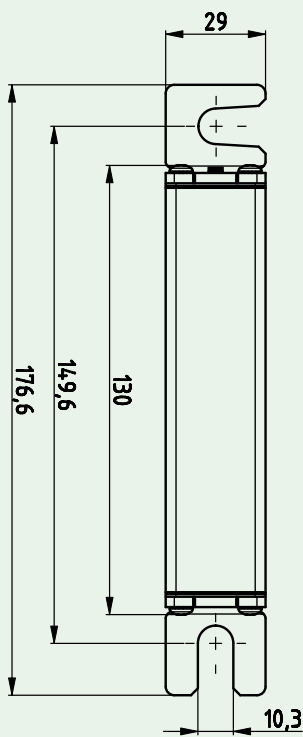


DC 1500V gPV

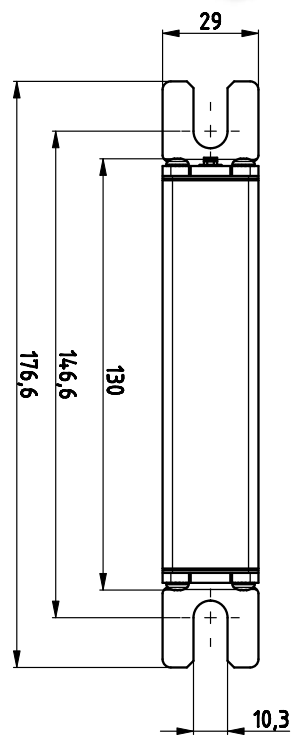
| Size | I_n [A] | gPV Standard indicator (pic.1) | gPV S_{150} screw contact (pic.2) | gPV U_{150} screw contact (pic.3) | Power dissipation ($0,7 \times I_n$) P_d [W] | Power dissipation [W] | Pre-arcing Joule integral [I^2t] (L/R = 3ms) | Operating Joule integral [I^2t] (L/R = 3ms) | Weight [g] | Packaging [pcs] |
|------|-----------|--------------------------------|-------------------------------------|-------------------------------------|--|-----------------------|--|---|------------|-----------------|
| 01XL | 50 | 004110692 | 004110743 | 004110749 | 7 | 18 | 500 | 3.000 | 350 | 3/30 |
| | 63 | 004110693 | 004110744 | 004110750 | 8,5 | 22 | 1.000 | 6.000 | | |
| | 80 | 004110694 | 004110745 | 004110751 | 9 | 21 | 2.000 | 15.000 | | |
| | 100 | 004110695 | 004110746 | 004110752 | 11 | 29 | 3.500 | 25.000 | | |
| | 125 | 004110696 | 004110747 | 004110753 | 13 | 36 | 4.000 | 30.000 | | |
| | 160 | 004110697 | 004110748 | 004110754 | 17 | 46 | 6.000 | 48.000 | | |



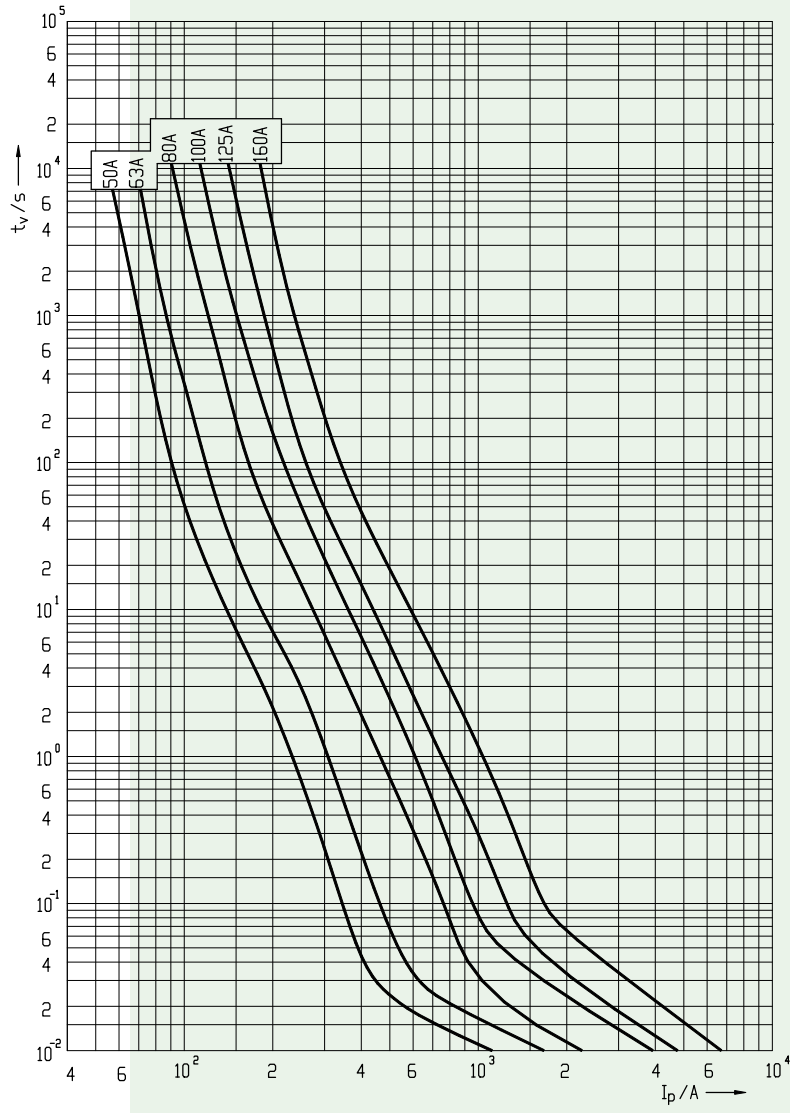
Picture 1



Picture 2



Picture 3



NH 01XL 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. NH1,2XL; 50kA d.c. NH3L |
| Standards | IEC 60269-6, UL 248-19 |
| Application | Fuse link for PV applications. Applied in fuse base PK XL 1500V. |

DC 1500V

| Size | I _n [A] | Standard indicator (pic.1) | gPV S ₁₇₀ screw contact (pic.2) | U ₁₇₀ screw contact (pic.3) | Power dissipation (0,7xI _n) P _d [W] | Power dissipation [W] | Pre-arcing Joule integral [I ² t] (L/R = 3ms) | Operating Joule integral [I ² t] (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 | | |
| | 250 | 004110567* | 004110598 | 004110613 | 19,3 | 44 | 73.000 | 132.000 | | |
| 3L | 315 | 004110630* | 004110635 | 004110640 | 22,2 | 57 | 65.000 | 300.000 | 1970 | 1/9 |
| | 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 | | |



* possible to mount microswitch NV55



Green protect - DC



| General characteristics | | UL file E347771 |
|-------------------------|--|-----------------|
| Rated voltage | 1500V d.c. (L/R=3ms) | |
| Breaking capacity | 50kA d.c. | |
| Standards | IEC 60269-6, UL 248-19 | |
| Application | Fuse link for PV applications. Applied in fuse base PK XL 1500V. | |

NEW!

| DC 1500V | | | | | | | | | |
|----------|-----------|---------------------------------|---------------------------------|--|-----------------------|--|---|------------|-----------------|
| Size | I_n [A] | gPV | | Power dissipation ($0,7 \times I_n$) P_d [W] | Power dissipation [W] | Pre-arcing Joule integral [I^2t] (L/R = 3ms) | Operating Joule integral [I^2t] (L/R = 3ms) | Weight [g] | Packaging [pcs] |
| | | S_{170} screw contact (pic.4) | U_{170} screw contact (pic.5) | | | | | | |
| 3L MS | 315 | 004110729 | 004110734 | 22,2 | 57 | 65.000 | 300.000 | 1970 | 1/9 |
| | 350 | 004110730 | 004110735 | 23,7 | 61 | 75.000 | 350.000 | | |
| | 400 | 004110731 | 004110736 | 26,8 | 67 | 85.000 | 450.000 | | |
| | 450 | 004110732 | 004110737 | 29 | 75 | 130.000 | 600.000 | | |
| | 500 | 004110733 | 004110738 | 44,3 | 79 | 160.000 | 700.000 | | |

It is possible to mount microswitch NV55 to all fuse links in the above table.



| General characteristics | | UL file E347771 |
|-------------------------|--|-----------------|
| Rated voltage | 1500V d.c. (L/R=3ms) | |
| Breaking capacity | 70kA d.c. (IEC 60947-3: test sequence IV) / 50kA d.c. (IEC 60269-6), UL 248-19 | |
| Standards | IEC 60269-6, IEC 60947-3: test sequence IV, UL 248-19 | |
| Application | Fuse link for battery protection applications. Applied in fuse base PK 3L 1500V. | |



NEW!

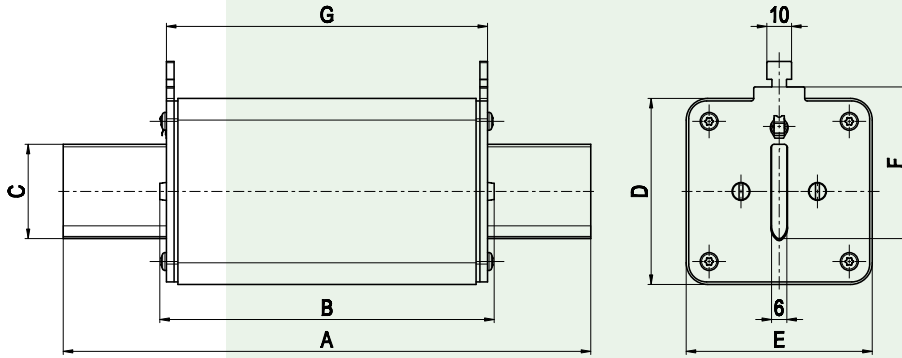
DC 1500V

| Size | I _n [A] | Standard indicator (pic.1) | gPV | | Power dissipation (0,7xI _n) P _d [W] | Power dissipation [W] | Pre-arcing Joule integral [I ² t] (L/R = 3ms) | Operating Joule integral [I ² t] (L/R = 3ms) | Weight [g] | Packaging [pcs] |
|------|--------------------|----------------------------|--|--|--|-----------------------|--|---|------------|-----------------|
| | | | S ₁₇₀ screw contact (pic.2) | U ₁₇₀ screw contact (pic.3) | | | | | | |
| 3L | 315 | 004110714* | 004110719 | 004110724 | 22,2 | 57 | 65.000 | 300.000 | 1970 | 1/9 |
| | 350 | 004110715* | 004110720 | 004110725 | 23,7 | 61 | 75.000 | 350.000 | | |
| | 400 | 004110716* | 004110721 | 004110726 | 26,8 | 67 | 85.000 | 450.000 | | |
| | 450 | 004110717* | 004110722 | 004110727 | 29 | 75 | 130.000 | 600.000 | | |
| | 500 | 004110718* | 004110723 | 004110728 | 44,3 | 79 | 160.000 | 700.000 | | |

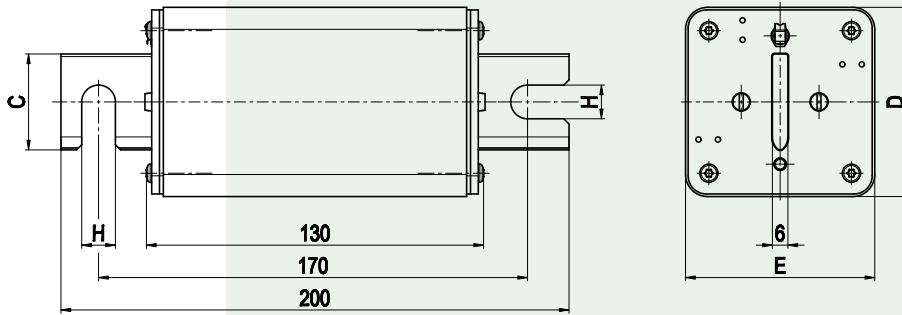
* possible to mount microswitch NV55



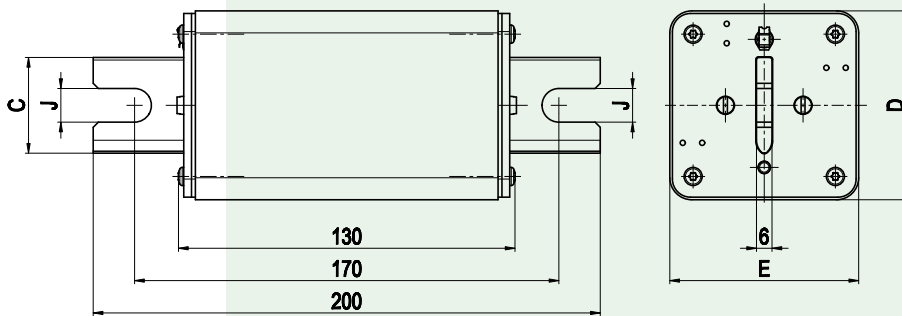
Picture 1



Picture 2

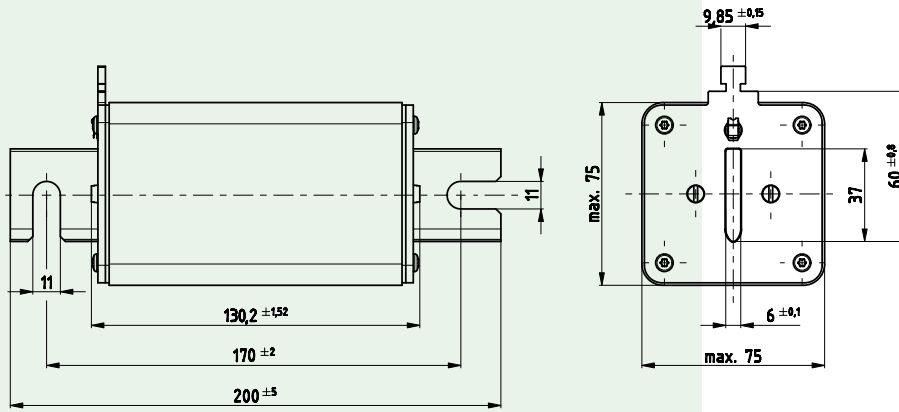


Picture 3

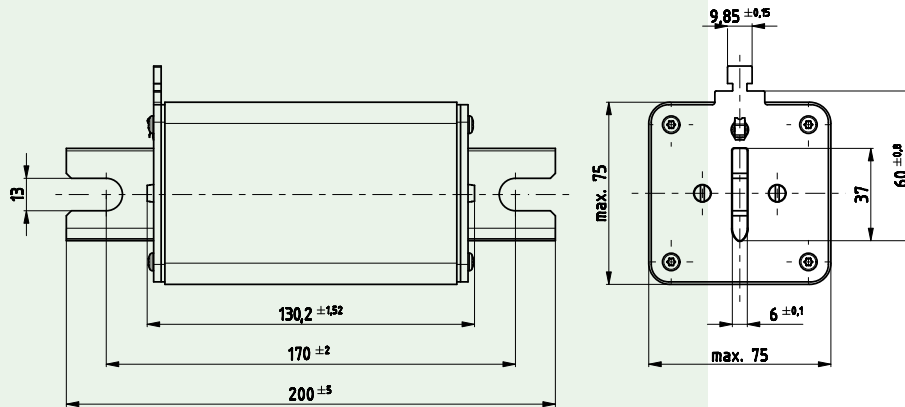


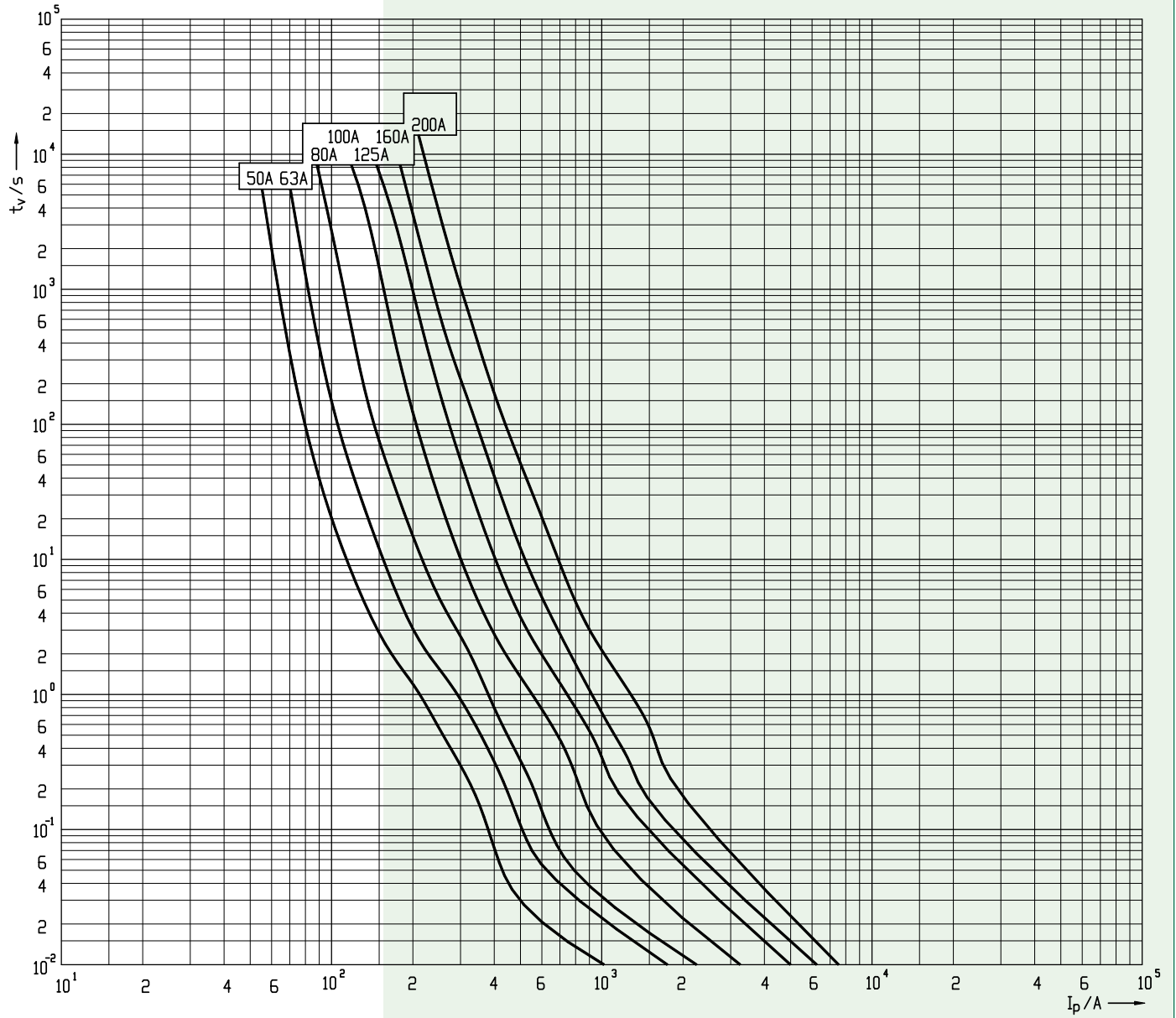
| Size | Dimensions [mm] | | | | | | | | |
|------|-----------------|-----|----|----|----|------|-----|----|----|
| | A | B | C | D | E | F | G | H | J |
| 1XL | 192 | 131 | 24 | 51 | 51 | 43,5 | 125 | 11 | 11 |
| 2XL | 208 | 130 | 30 | 60 | 60 | 48 | 126 | 11 | 13 |
| 3L | 208 | 130 | 37 | 73 | 73 |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

Picture 4

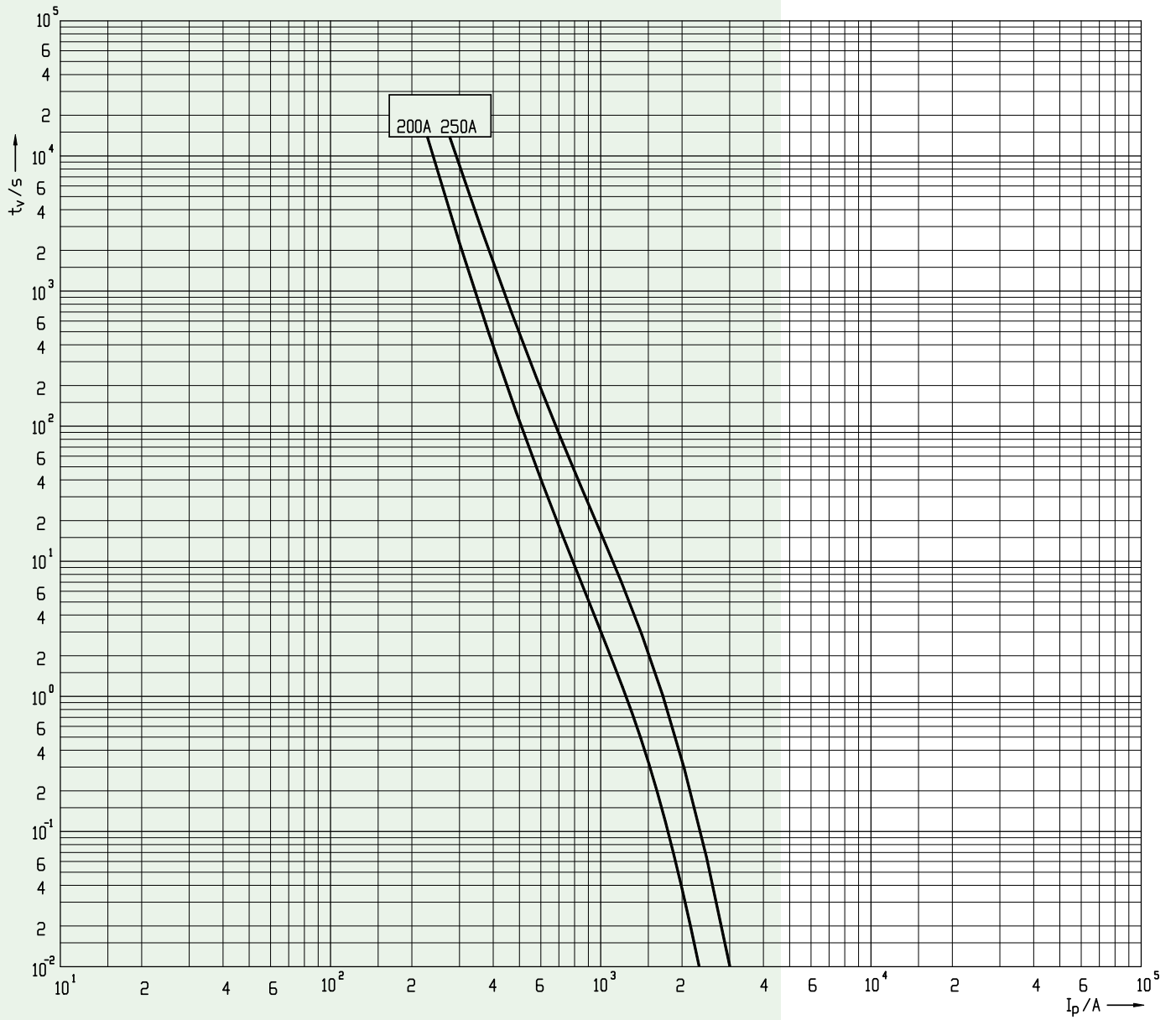


Picture 5

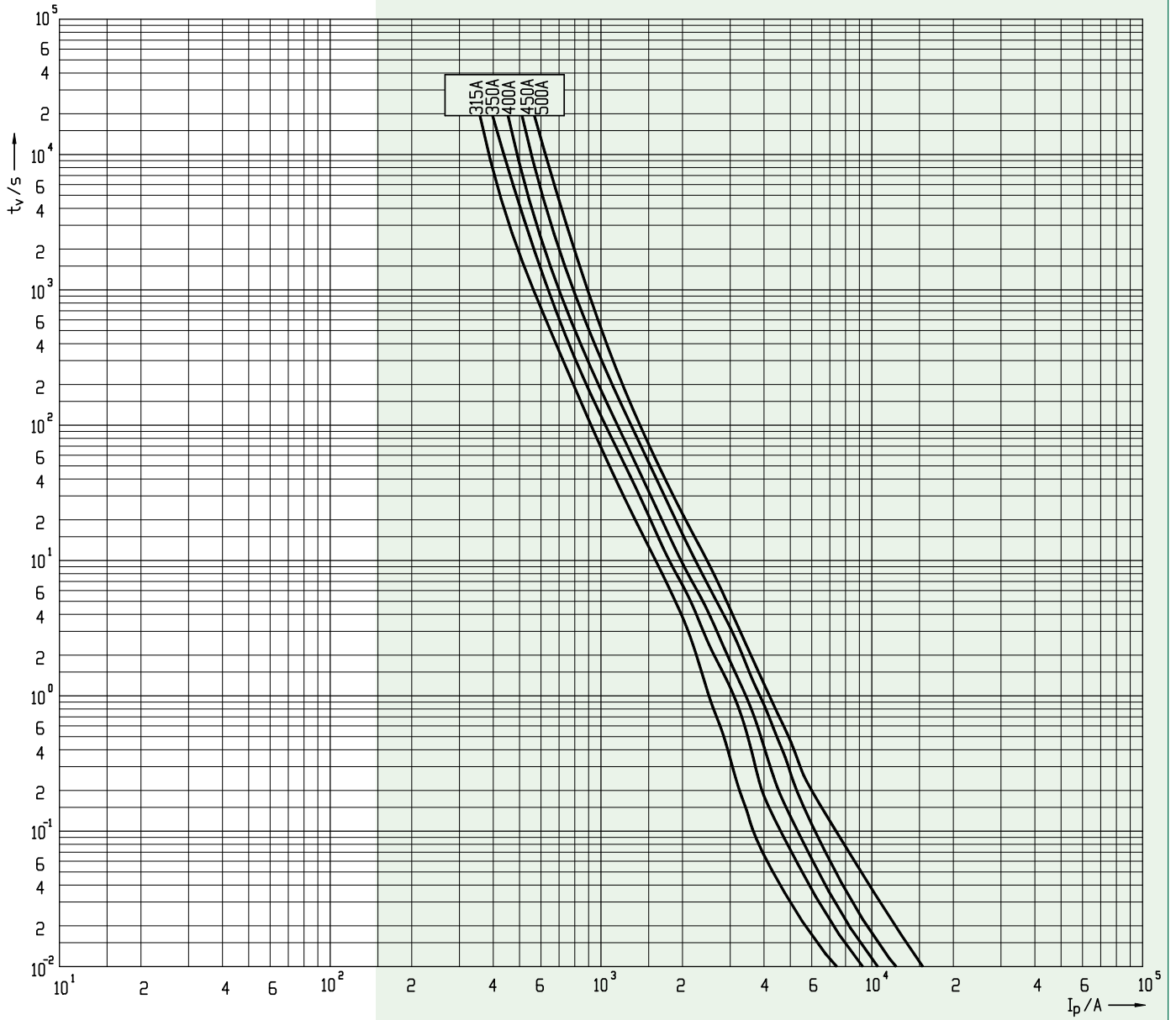




t-I characteristics NH 1XL



t-I characteristics NH 2XL



t-I characteristics NH 3L

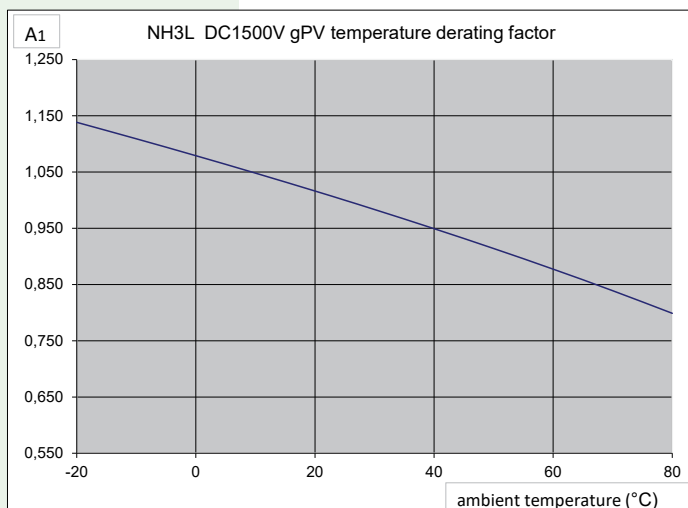
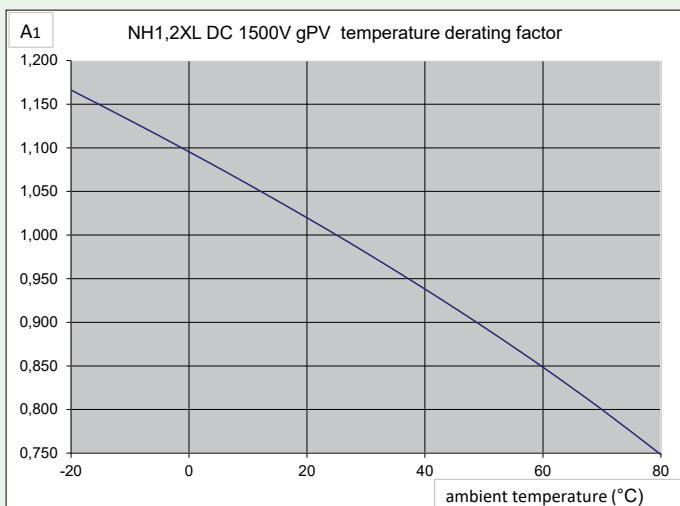
| 315 A | | | | | | | |
|-----------|--------|--------|-------|--------|-------|--------|-------|
| cut-off | L/R | | | | | | |
| I_p /kA | 0,1 ms | 0,5 ms | 1 ms | 1,5 ms | 2 ms | 2,5 ms | 3 ms |
| 10 | 10 kA | 9 kA | 9 kA | 8 kA | 8 kA | 8 kA | 8 kA |
| 20 | 17 kA | 13 kA | 12 kA | 11 kA | 11 kA | 10 kA | 10 kA |
| 30 | 22 kA | 16 kA | 14 kA | 13 kA | 12 kA | 12 kA | 12 kA |
| 40 | 25 kA | 19 kA | 16 kA | 14 kA | 14 kA | 13 kA | 13 kA |
| 50 | 28 kA | 20 kA | 17 kA | 16 kA | 15 kA | 14 kA | 14 kA |
| 60 | 30 kA | 21 kA | 18 kA | 17 kA | 16 kA | 16 kA | 15 kA |
| 70 | 33 kA | 22 kA | 19 kA | 18 kA | 17 kA | 17 kA | 16 kA |
| 80 | 36 kA | 26 kA | 23 kA | 20 kA | 19 kA | 19 kA | 18 kA |
| 90 | 38 kA | 28 kA | 24 kA | 22 kA | 20 kA | 20 kA | 19 kA |
| 100 | 41 kA | 30 kA | 25 kA | 23 kA | 21 kA | 21 kA | 20 kA |

| 350 A | | | | | | | |
|-----------|--------|--------|-------|--------|-------|--------|-------|
| cut-off | L/R | | | | | | |
| I_p /kA | 0,1 ms | 0,5 ms | 1 ms | 1,5 ms | 2 ms | 2,5 ms | 3 ms |
| 10 | 10 kA | 10 kA | 9 kA | 9 kA | 9 kA | 8 kA | 8 kA |
| 20 | 18 kA | 14 kA | 13 kA | 12 kA | 12 kA | 11 kA | 11 kA |
| 30 | 23 kA | 17 kA | 15 kA | 14 kA | 13 kA | 13 kA | 12 kA |
| 40 | 27 kA | 19 kA | 17 kA | 16 kA | 15 kA | 14 kA | 14 kA |
| 50 | 31 kA | 21 kA | 18 kA | 17 kA | 16 kA | 16 kA | 15 kA |
| 60 | 32 kA | 24 kA | 19 kA | 18 kA | 17 kA | 17 kA | 16 kA |
| 70 | 34 kA | 25 kA | 21 kA | 20 kA | 19 kA | 18 kA | 17 kA |
| 80 | 38 kA | 27 kA | 24 kA | 23 kA | 21 kA | 20 kA | 20 kA |
| 90 | 40 kA | 30 kA | 26 kA | 24 kA | 22 kA | 21 kA | 21 kA |
| 100 | 43 kA | 32 kA | 27 kA | 25 kA | 23 kA | 22 kA | 22 kA |

| 400 A | | | | | | | |
|---------|--------|--------|-------|--------|-------|--------|-------|
| cut-off | L/R | | | | | | |
| Ip/kA | 0,1 ms | 0,5 ms | 1 ms | 1,5 ms | 2 ms | 2,5 ms | 3 ms |
| 10 | 10 kA | 10 kA | 10 kA | 10 kA | 9 kA | 9 kA | 9 kA |
| 20 | 19 kA | 16 kA | 14 kA | 13 kA | 13 kA | 12 kA | 12 kA |
| 30 | 24 kA | 19 kA | 17 kA | 16 kA | 15 kA | 14 kA | 14 kA |
| 40 | 29 kA | 21 kA | 19 kA | 18 kA | 16 kA | 16 kA | 15 kA |
| 50 | 33 kA | 23 kA | 21 kA | 19 kA | 18 kA | 17 kA | 16 kA |
| 60 | 36 kA | 25 kA | 22 kA | 20 kA | 19 kA | 19 kA | 18 kA |
| 70 | 38 kA | 28 kA | 23 kA | 21 kA | 20 kA | 20 kA | 19 kA |
| 80 | 41 kA | 30 kA | 26 kA | 25 kA | 24 kA | 23 kA | 22 kA |
| 90 | 45 kA | 33 kA | 29 kA | 27 kA | 25 kA | 24 kA | 23 kA |
| 100 | 48 kA | 35 kA | 30 kA | 28 kA | 26 kA | 25 kA | 24 kA |

| 450 A | | | | | | | |
|---------|--------|--------|-------|--------|-------|--------|-------|
| cut-off | L/R | | | | | | |
| Ip/kA | 0,1 ms | 0,5 ms | 1 ms | 1,5 ms | 2 ms | 2,5 ms | 3 ms |
| 10 | 10 kA | 10 kA | 10 kA | 10 kA | 9 kA | 9 kA | 9 kA |
| 20 | 20 kA | 17 kA | 16 kA | 15 kA | 14 kA | 13 kA | 13 kA |
| 30 | 26 kA | 21 kA | 19 kA | 18 kA | 17 kA | 16 kA | 15 kA |
| 40 | 32 kA | 24 kA | 21 kA | 20 kA | 18 kA | 18 kA | 17 kA |
| 50 | 36 kA | 27 kA | 24 kA | 22 kA | 20 kA | 19 kA | 18 kA |
| 60 | 41 kA | 29 kA | 25 kA | 23 kA | 22 kA | 21 kA | 19 kA |
| 70 | 44 kA | 32 kA | 27 kA | 25 kA | 23 kA | 22 kA | 22 kA |
| 80 | 48 kA | 35 kA | 30 kA | 29 kA | 27 kA | 26 kA | 25 kA |
| 90 | 52 kA | 37 kA | 33 kA | 30 kA | 28 kA | 27 kA | 26 kA |
| 100 | 55 kA | 40 kA | 35 kA | 31 kA | 29 kA | 28 kA | 27 kA |

| 500 A | | | | | | | |
|---------|--------|--------|-------|--------|-------|--------|-------|
| cut-off | L/R | | | | | | |
| Ip/kA | 0,1 ms | 0,5 ms | 1 ms | 1,5 ms | 2 ms | 2,5 ms | 3 ms |
| 10 | 10 kA | 10 kA | 10 kA | 10 kA | 9 kA | 9 kA | 9 kA |
| 20 | 20 kA | 17 kA | 16 kA | 15 kA | 14 kA | 14 kA | 13 kA |
| 30 | 28 kA | 23 kA | 20 kA | 18 kA | 17 kA | 17 kA | 16 kA |
| 40 | 35 kA | 27 kA | 23 kA | 21 kA | 20 kA | 19 kA | 18 kA |
| 50 | 40 kA | 30 kA | 26 kA | 24 kA | 22 kA | 21 kA | 20 kA |
| 60 | 47 kA | 33 kA | 28 kA | 26 kA | 24 kA | 23 kA | 21 kA |
| 70 | 50 kA | 35 kA | 30 kA | 28 kA | 26 kA | 24 kA | 23 kA |
| 80 | 55 kA | 39 kA | 34 kA | 31 kA | 30 kA | 28 kA | 27 kA |
| 90 | 59 kA | 41 kA | 36 kA | 33 kA | 32 kA | 31 kA | 29 kA |
| 100 | 61 kA | 44 kA | 39 kA | 35 kA | 33 kA | 32 kA | 30 kA |



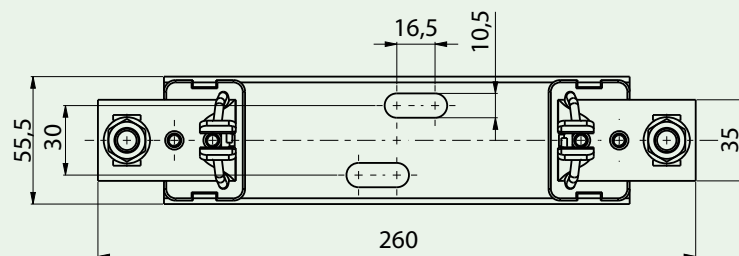
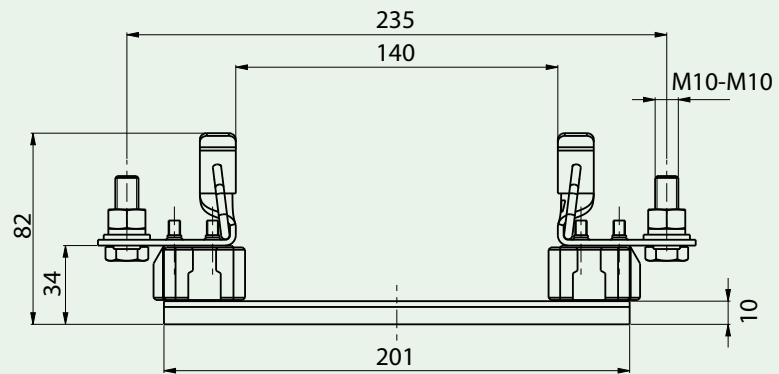
Fuse base PK XL

General characteristics

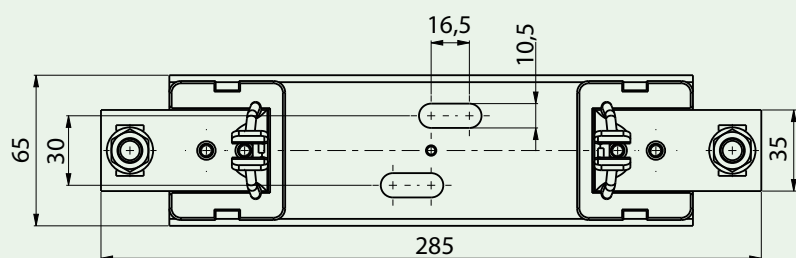
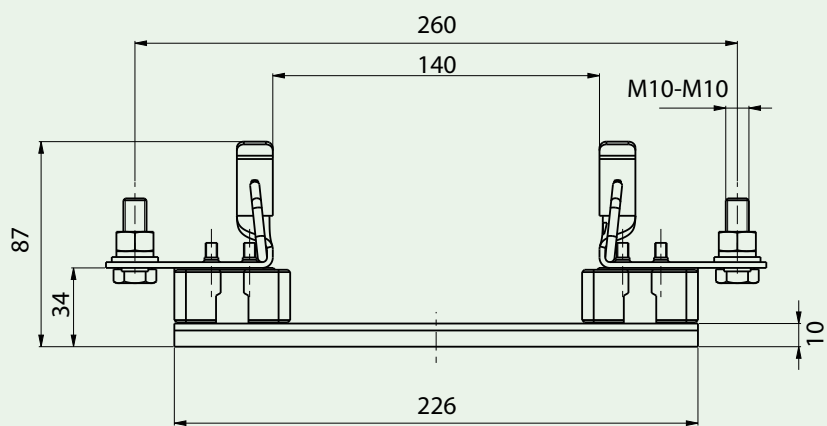
| | |
|--|--|
| Rated voltage | 1500V a.c./d.c. |
| Rated current | 250A, 400A, 630A |
| Insulation class | C-VDE 0110 |
| Rated torque-contact (size 1XL,2XL,3L) | 32Nm |
| Rated torque (mounting plate) | 12Nm |
| Degree of protection | IP00 |
| Standards | EN 60269, IEC60269, DIN VDE 0636, DIN 43620,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

Fuse base PK XL

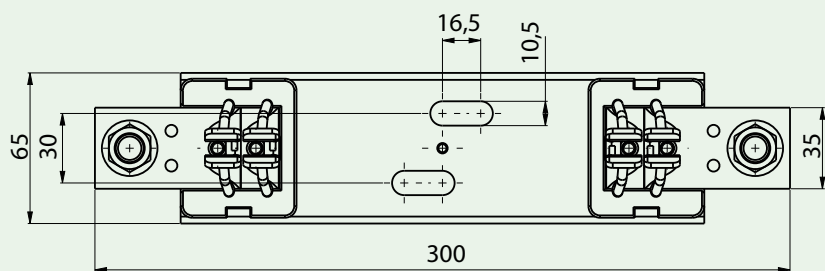
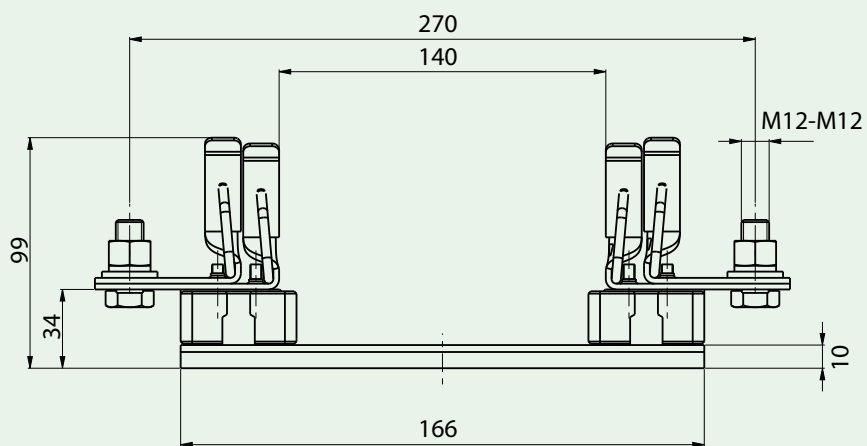
| Type | I_n [A] | Cable lugs according to DIN 46235 [mm ²] | Code No. | Weight [g] | Packaging [pcs] |
|------------------------|-----------|--|-----------|------------|-----------------|
| PK1XL M10-M10 1500V 1p | 250 | 25-150 | 004132017 | 675 | 3 |
| PK2XL M10-M10 1500V 1p | 400 | 25-240 | 004132019 | 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 ² | 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 ² | 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



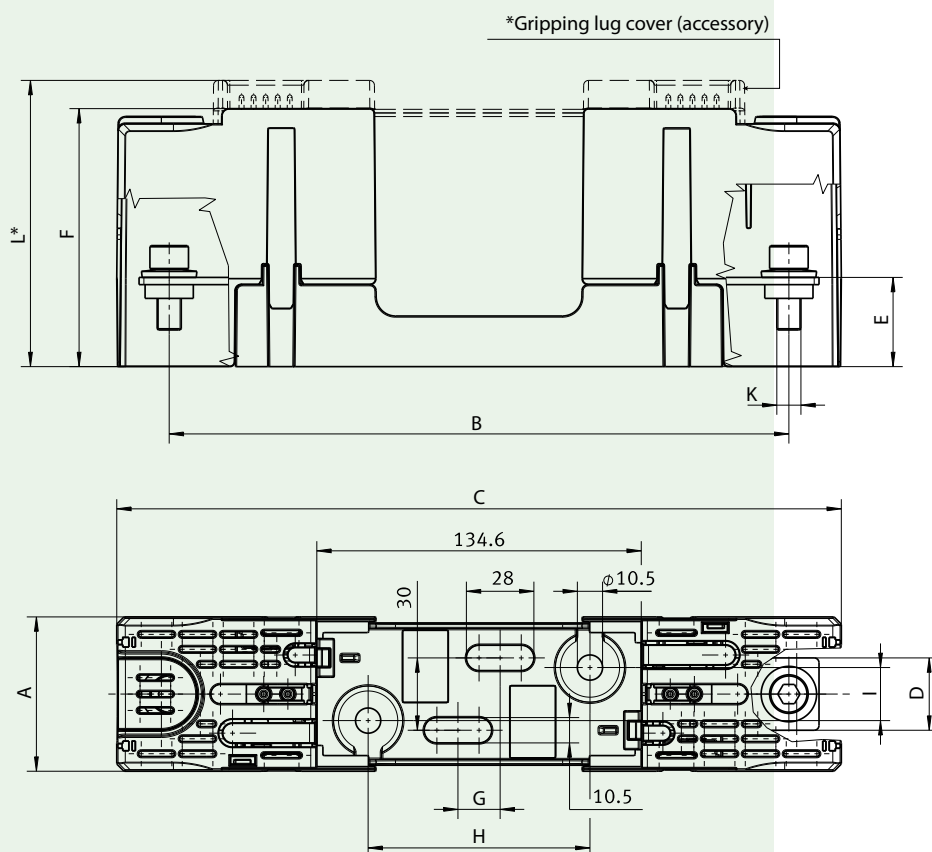
Fuse base U1...3/GZ/1500/H

| Type | I _n [A] | Code No. | Max. Connection (mm ²) | 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 |



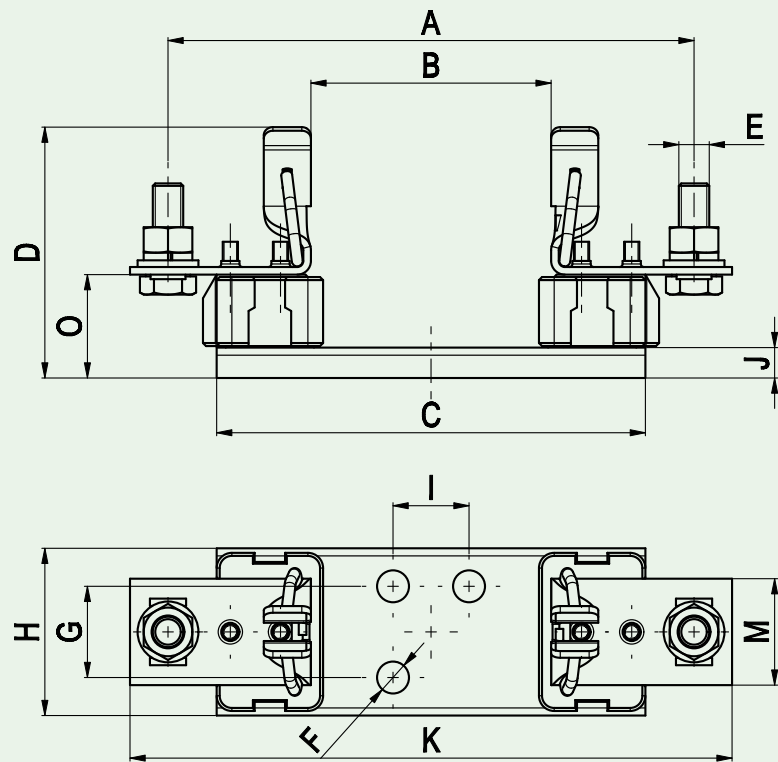
Fuse base PK0, 1, 2, 3 DC

General characteristics

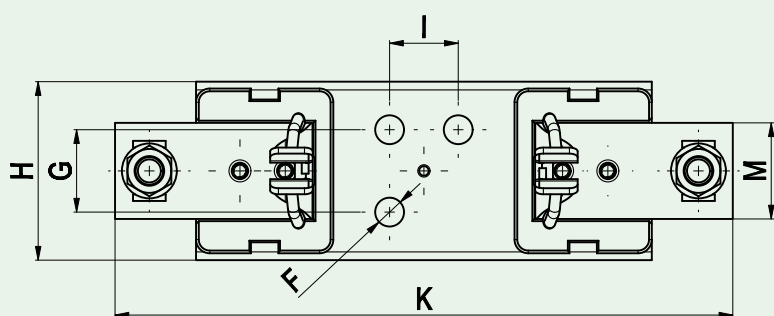
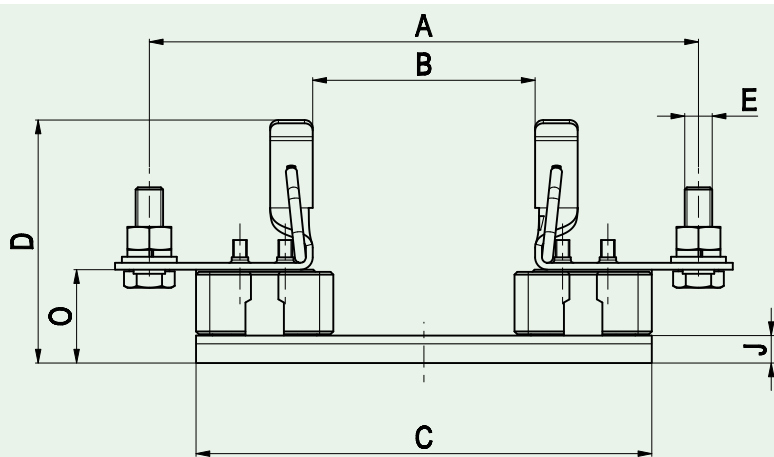
| | |
|-----------------------------------|---|
| Rated voltage | 1000V a.c./d.c. |
| Rated current | 160A, 250A, 400A, 630A |
| Terminal torque | 10 Nm, 32 Nm |
| Cable lugs according to DIN 46235 | 25-150mm ² , 25-240mm ² , 25-300mm ² |
| Insulation class | C-VDE 0110 |
| Degree of protection | IP00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

Fuse base PK

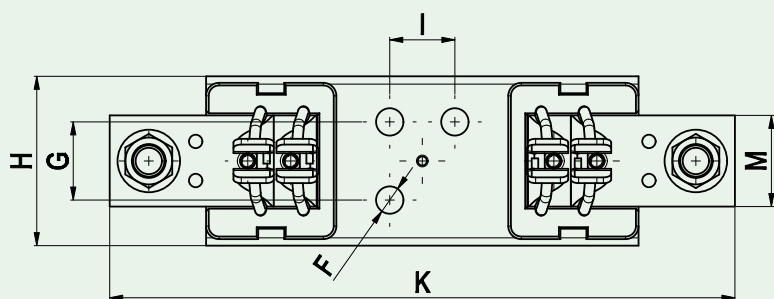
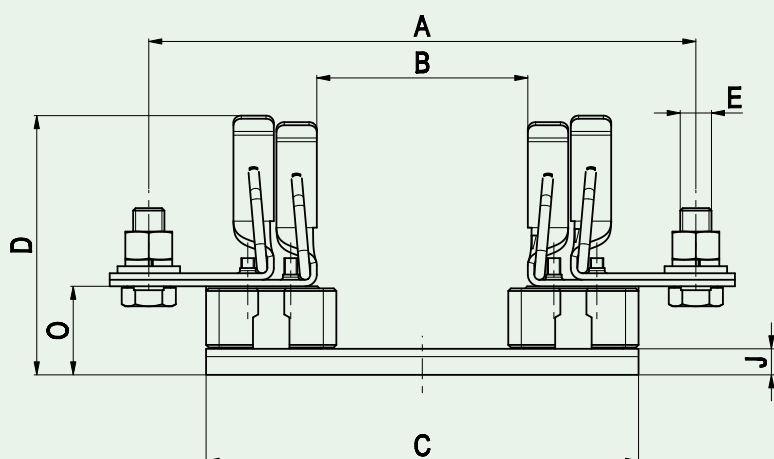
| Type | I _n [A] | Cable lugs according to DIN 46235 [mm ²] | Code No. | Weight [g] | Packaging [pcs] |
|--------------------------|--------------------|--|-----------|------------|-----------------|
| PK0 DC | 160 | | 004122033 | 258 | 3/90 |
| PK 1 M10-M10 DC 1000V 1p | 250 | 25-150 | 004122025 | 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

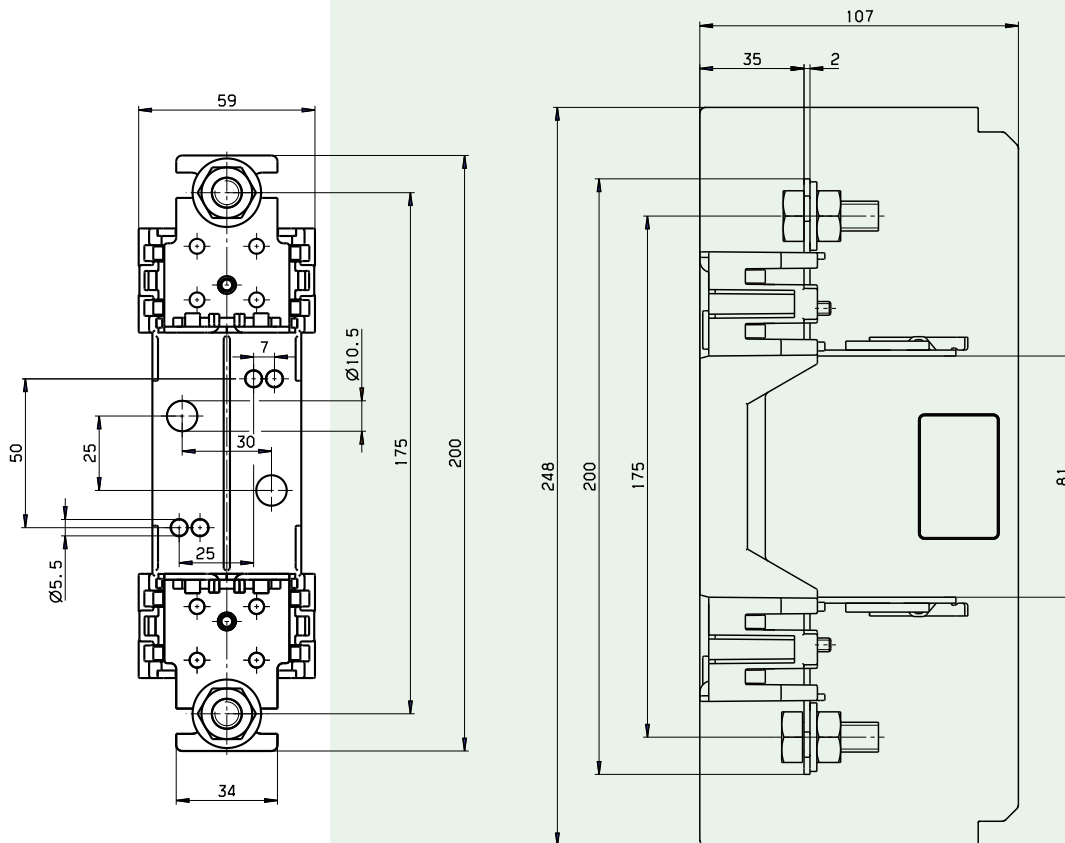


General characteristics

| | | |
|---|-----------------------|------------------------|
| 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 ² |
| | Flat termination | 30x10 mmx-mm |
| | Rated torque | 30-35 Nm |

Fuse base U1-1/GZ/PV

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



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

General characteristics

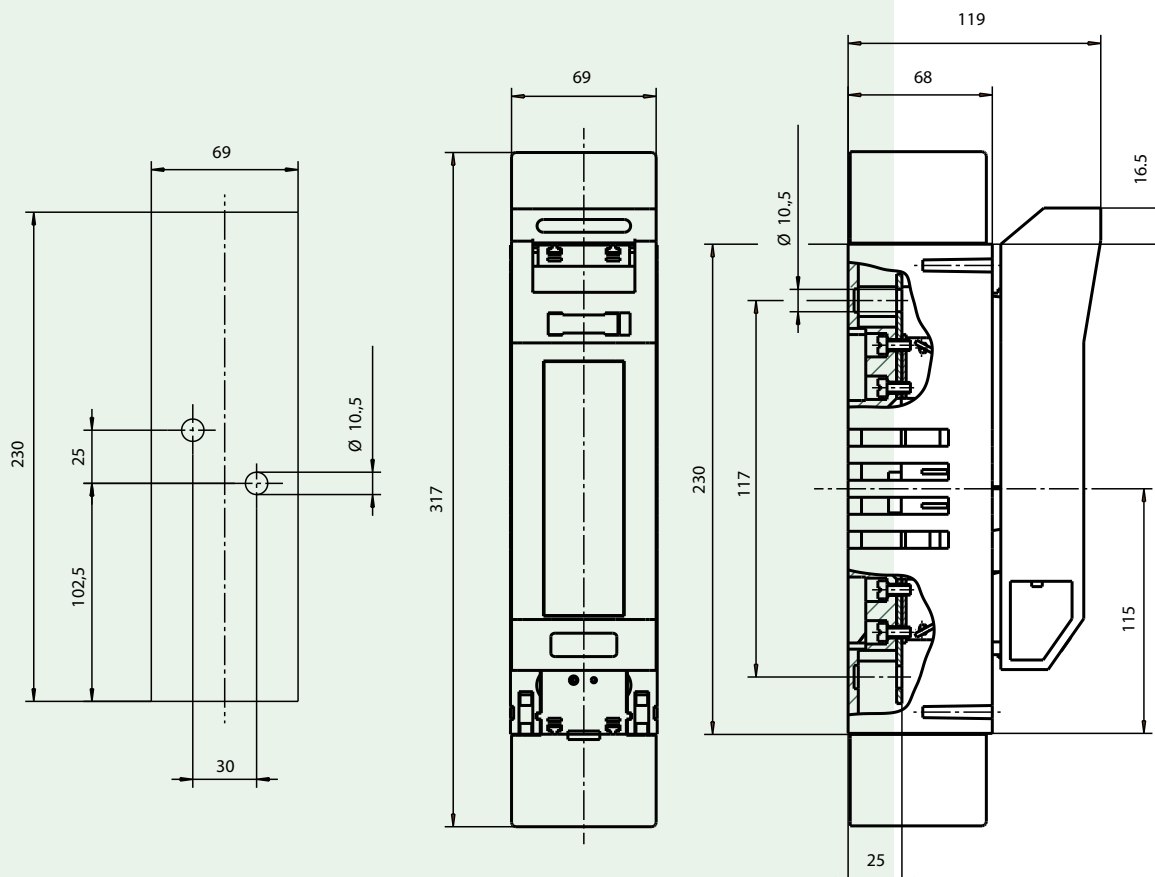
| | | |
|--|---------------------------------------|----------------------------|
| Number of poles | 1 | |
| Rated voltage | 1000V d.c. | |
| Rated current | 160A | |
| Conv. free air thermal current with fuse-links | 160A | |
| Utilization category | DC-20B | |
| Fuse-links | Size to DIN 43620 | 1C, 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 ² |
| | 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 _n [A] | Code No. | Max. Connection (mm ²) | 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 ² | 25-300 mm ² |
| | 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 | |

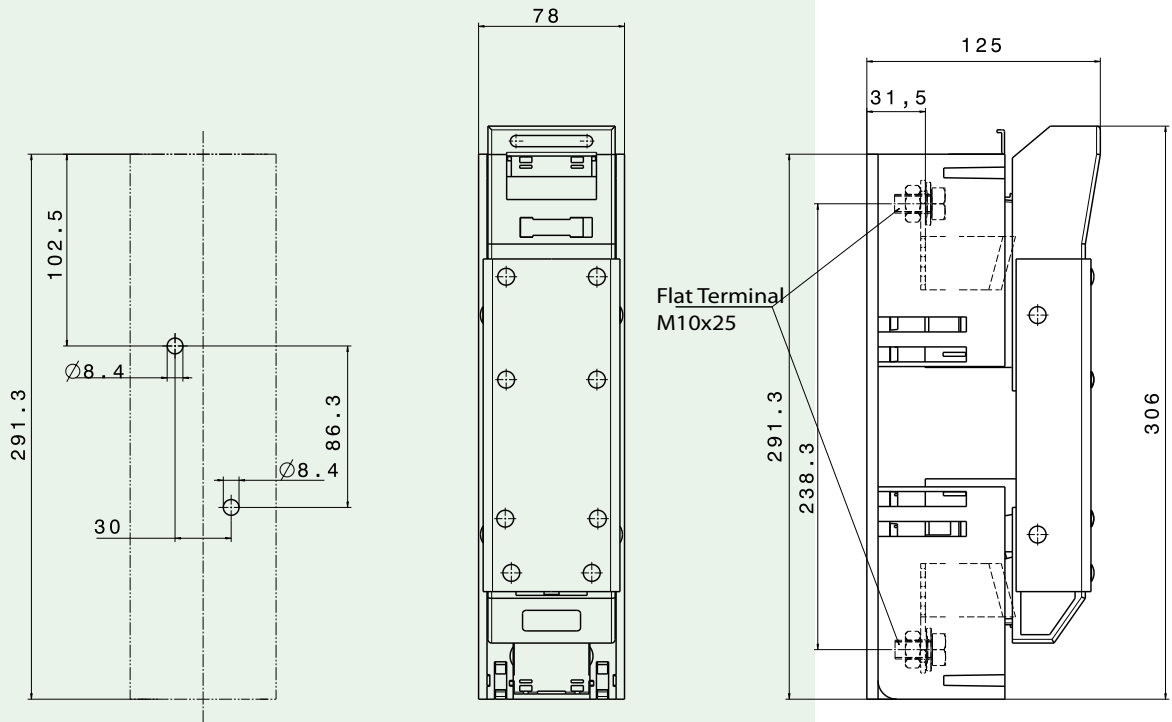
*35°C normal temperature, 55°C with reduced operating current



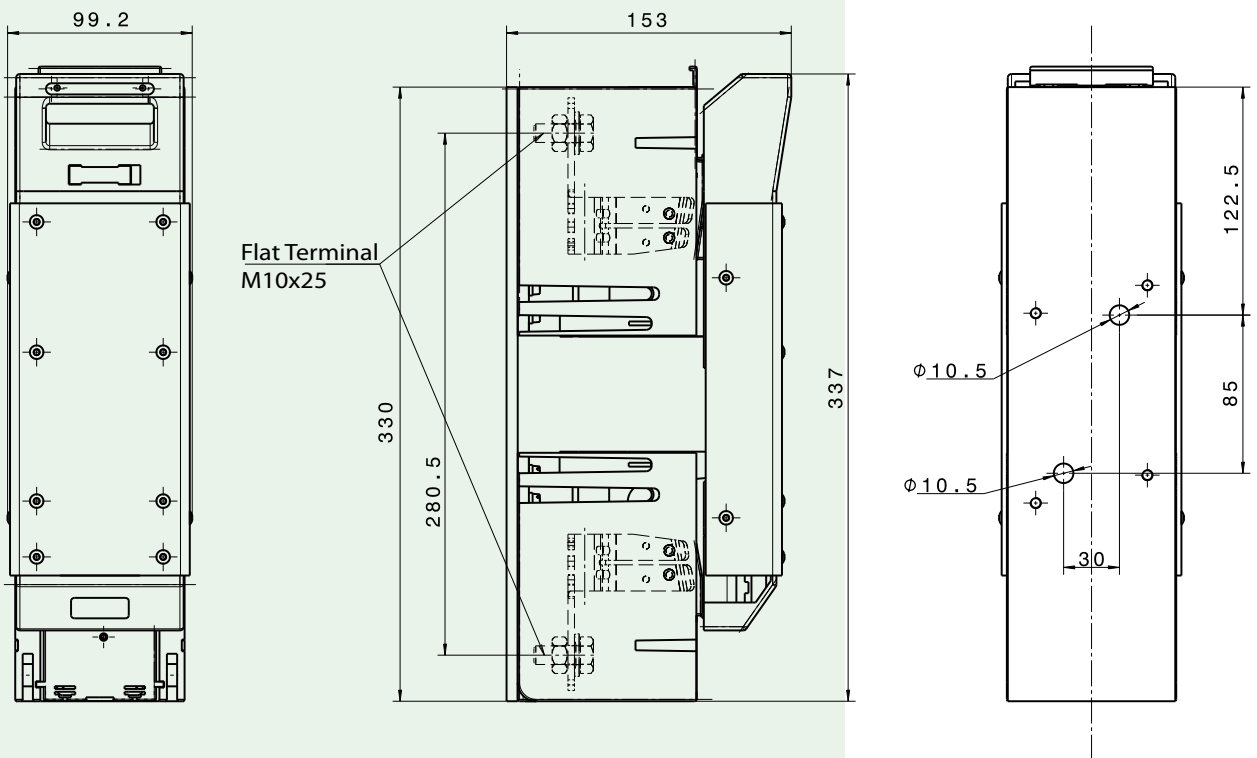
Photovoltaic fuseholder TL1,3-1/9/1200V

| Type | I _n [A] | Code No. | Max. Connection (mm ²) | 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



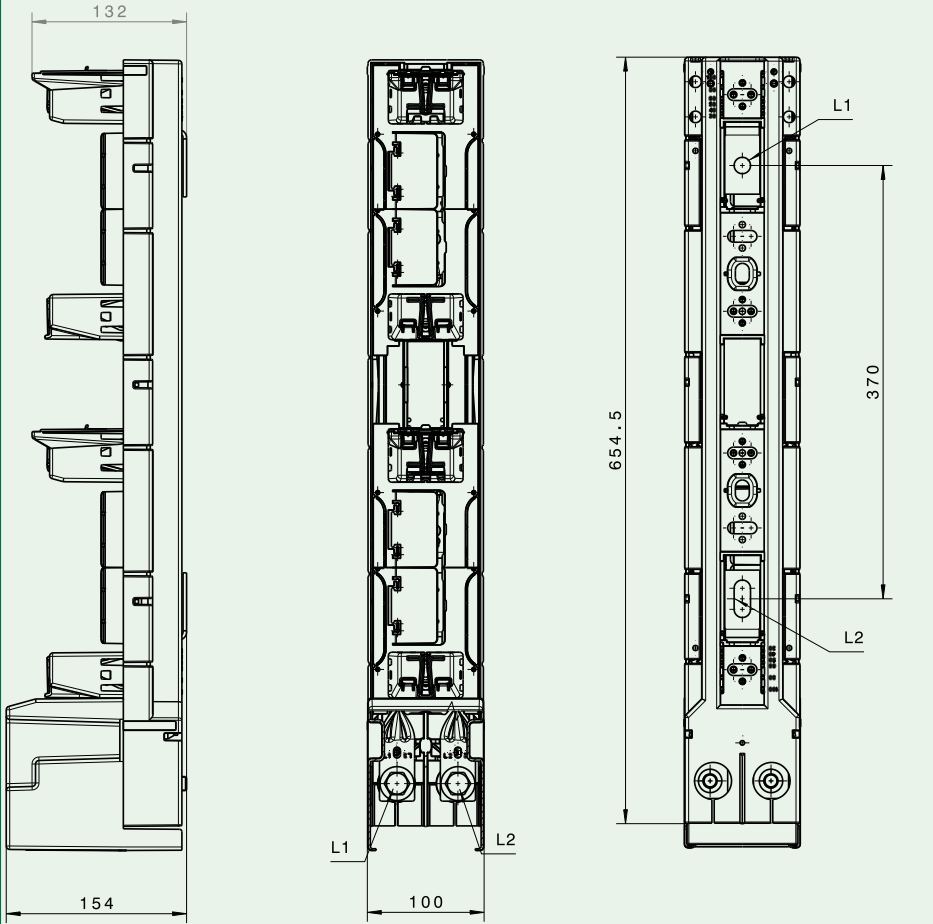
NH strip-fuseways L2,3-2 / 1200V

| 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 ² | 1 x 25-240 mm ² |
| | | Flat bar | 30x10 mm | 30x10 mm |
| | | Tightening torque | 35-40 Nm | 35-40 Nm |
| | Clamp KM2G | Clamping cross-section | 25-150mm ² /185-300mm ² | 25-150mm ² /185-300mm ² |
| | | Tightening torque | 32 Nm | 32 Nm |
| | Clamp KM2G-F | Clamping cross-section | 25-240 mm ² | 25-240 mm ² |
| | | 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 | |

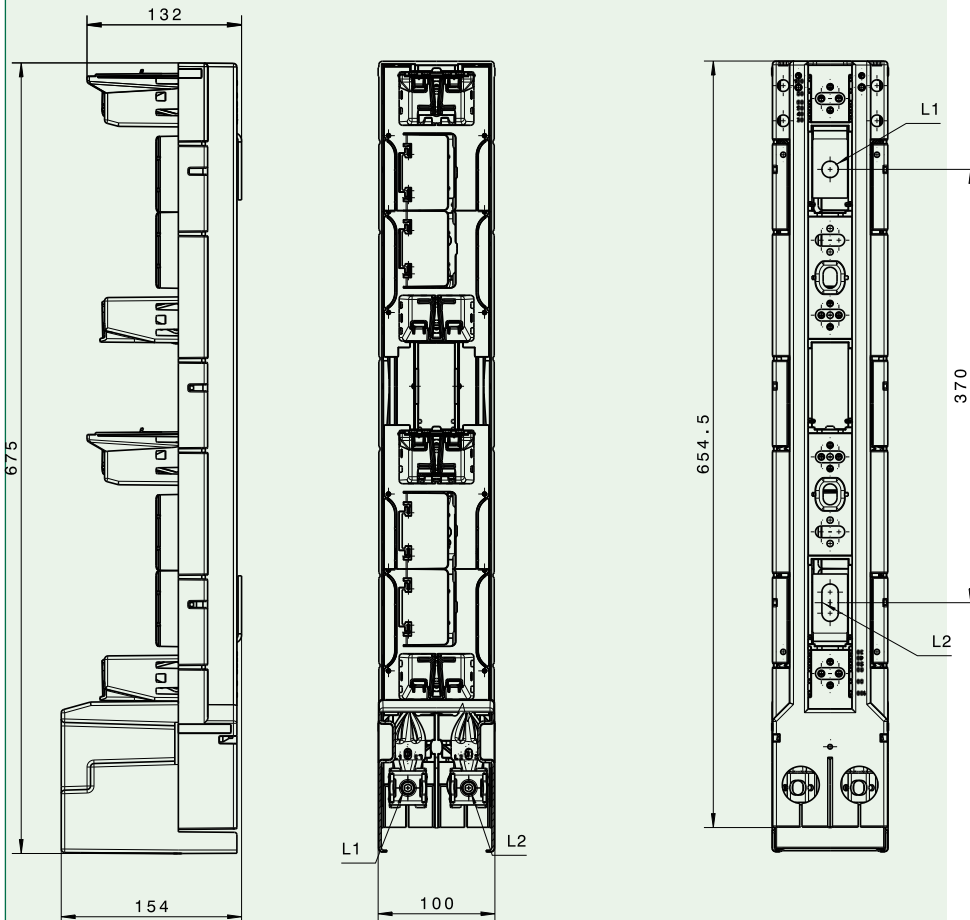
*35°C normal temperature, 55°C with reduced operating current

| NH strip-fuseways L2,3-2/1200V | | | | | | |
|--------------------------------|--------------------|-----------|------------------------------------|--------------------------|------------|-----------------|
| Type | I _n [A] | Code No. | Max. Connection (mm ²) | 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



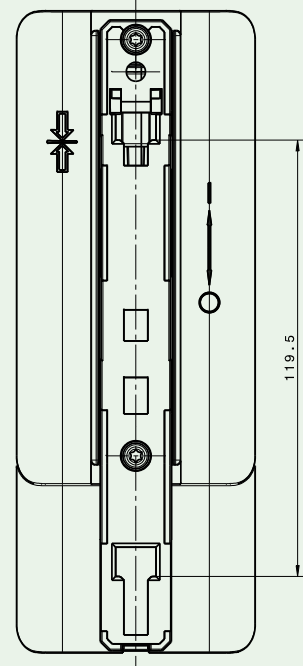
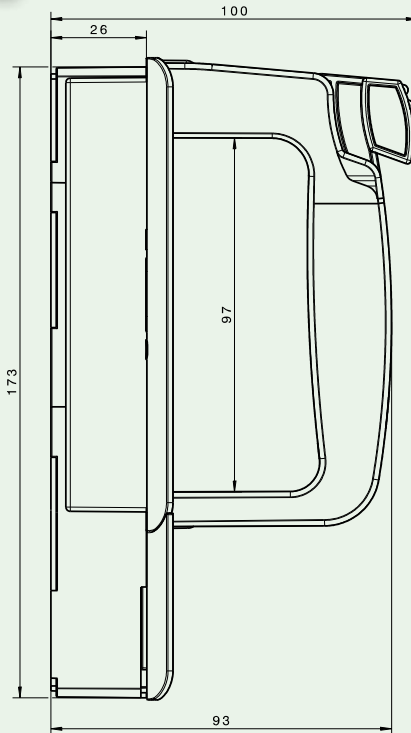
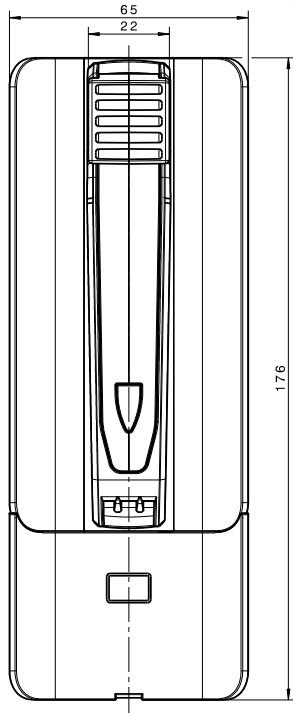
Steel-frame clamp KM2G-F



NH handle



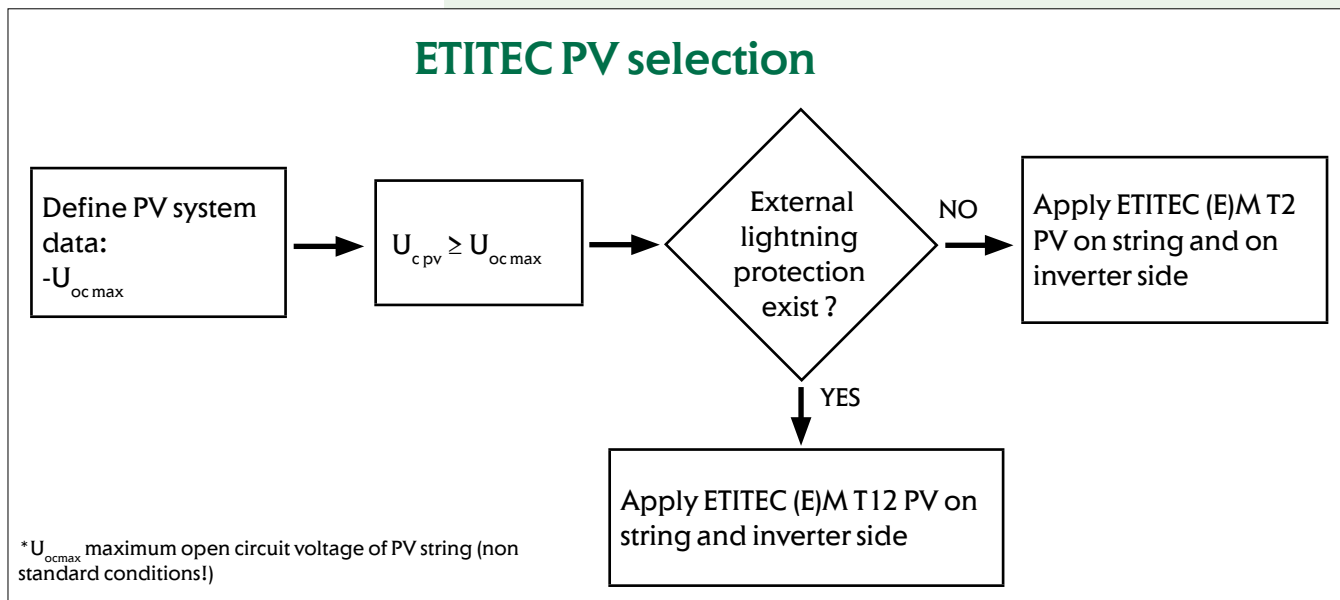
| NH handle for fuse link DC 1100V and DC 1500V | | | |
|---|----------|------------|-----------------|
| Code | Type | Weight [g] | Packaging [pcs] |
| 001691062 | GPN 1500 | 590 | 1 |



ETITEC - Lightning and Surge Arresters

Overvoltage protection selection

ETITEC PV selection



ETITEC (E)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 35mm²

ETITEC M T12 PV

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

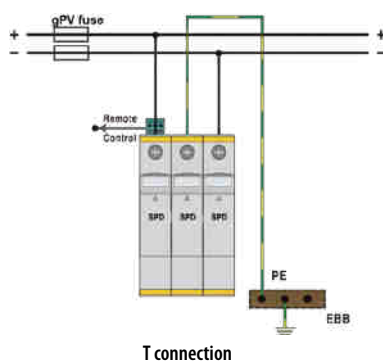
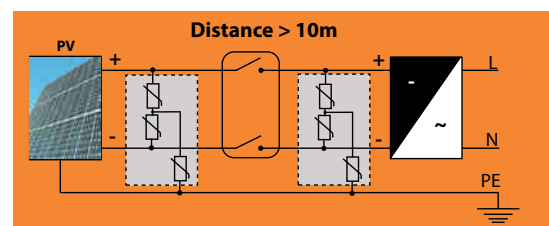
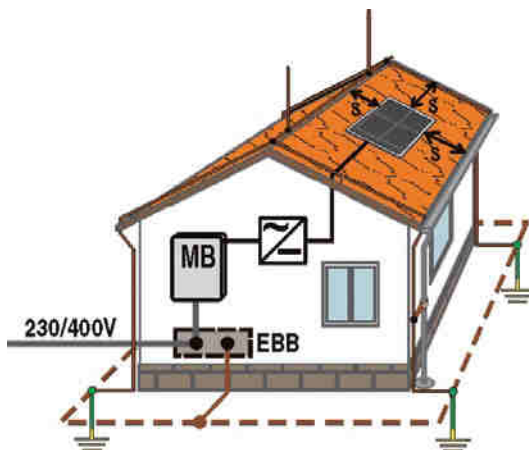
Suitable for green field installations (EN50539-12)

ETITEC EM T12 PV

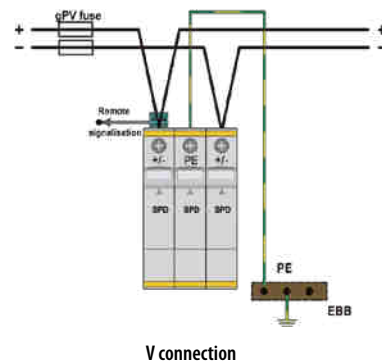
Location of Use: String box, Inverter
 Mode of Protection:(+) - PE, (-) - PE, (+) - (-)
 Surge Ratings: I_{Total} =up to 6.25 kA (10/350 μ s)
 I_{Total} =up to 65 kA (8/20 μ s)
 EN Category: Type 1, Type 2
 Protective Elements: High Energy MOV
 Housing: Pluggable Design
 Compliance: EN 50539-11:2013+A1:2014

Suitable for roof installations (EN50539-12)

ETITEC (E)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.

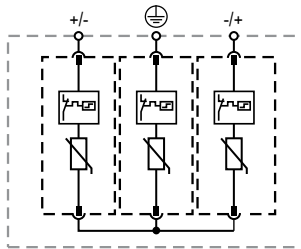
ETITEC M T12 PV

| 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 | 30 | 12,5 | 6,25 | 20 | 488 | 1/5 |
| ETITEC M T12 PV 1500/10 Y RC | 002440514 | 1500 | 30 | 12,5 | 6,25 | 20 | 497 | 1/5 |

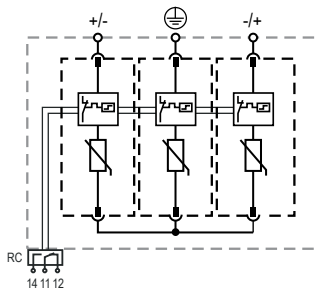
*RC - remote contact for remote signalisation of bad module (to be replaced)



ETITEC M T12 PV 1100/12,5 Y RC



ETITEC M T12 PV ... Y



ETITEC M T12 PV ... Y RC

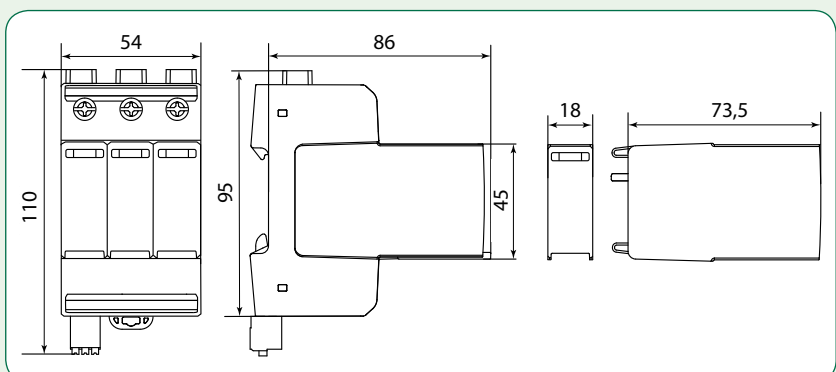
Spare (replacement) modules

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

*left or right module (Y connection)

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 UCPV | 1100 V | 1500V |
| Nominal Discharge Current (8/20 μ s) I_n | 20 kA | 20 kA |
| Total Discharge Current (8/20 μ s) I_{Total} | 50 kA | 60 kA |
| Impulse Discharge Current (10/350) | 6,25 kA | 5 kA |
| Total Discharge Current (10/350 μ s) I_{Total} | 12,5 kA | 10 kA |
| Specific Energy W/R | 9,77 kJ/ Ω | 9,77 kJ/ Ω |
| Charge | 3,125 As | 2,5 As |
| Voltage Protection Level Up | < 3,8 kV | < 4,5 kV |
| Response Time tA | < 25 ns | |
| Number of Ports | 1 | |
| Thermal Protection | ✓ | |
| Short-Circuit Current Rating SCCR ISCPV | 11 kA | |
| Operating Temperature Range Ta | - 40°C ... +85°C | |
| Permissible Operating Humidity RH | 5% - 95% | |
| Altitude (max) | 4000 m | |
| Operating State / Fault Indication | Green Flag / Not Green Flag | |
| Conductor Cross Section (max) | 35 mm ² (Solid, Stranded) / 25 mm ² (Flexible) | |
| Terminal Screw Torque Mmax | 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 | |
| Remote contacts - type ...RC | | |
| Contacts ratings | AC: 250V/1A; 125V/1A; DC: 48V/0,5A, 24V/0,5A, 12V/0,5A | |
| Terminal cross section | Max. 1,5 mm ² | |
| Terminal Screw Torque Mmax | 0,25 Nm | |
| Standards | EN 50539-11:2013+A1:2014 | |



ETITEC EM 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 EM T12 PV 1100/6,25 Y | 002440580 | 1100 | 11 | 6,25 | 6,25 | 20 | 397 | 1/5 |
| ETITEC EM T12 PV 1100/6,25 Y RC | 002440581 | 1100 | 11 | 6,25 | 6,25 | 20 | 406 | 1/5 |
| ETITEC EM T12 PV 1500/5 Y | 002440582 | 1500 | 11 | 5 | 5 | 20 | 488 | 1/5 |
| ETITEC EM T12 PV 1500/5 Y RC | 002440583 | 1500 | 11 | 5 | 5 | 20 | 497 | 1/5 |

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

Spare (replacement) modules

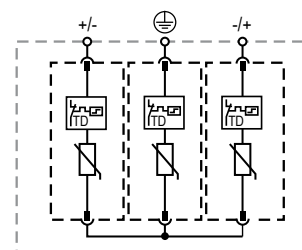
| Type | Code No. | Compatible with | Weight [g] | Packaging [pcs] |
|-------------------------|-----------|-----------------------------------|---------------|--------------------|
| MOD. EM T12 PV 550/6,25 | 002440584 | ETITEC EM T12 PV 1100/6,25 Y (RC) | 79 | 1/28 |
| MOD. EM T12 PV 750/5 | 002440585 | ETITEC EM T12 PV 1500/5 Y (RC) | 87 | 1/28 |

Technical data

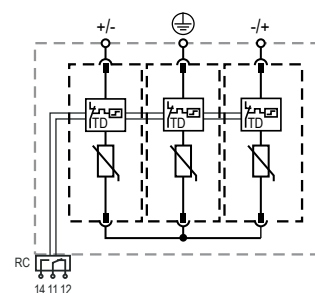
| Type | ETITEC EM T12 PV 1100/6,25 Y (RC) | ETITEC EM T12 PV 1500/5 Y (RC) |
|--|--|--------------------------------|
| | T1,T2 / I,II / B,C/1CA | |
| Maximum Continuous Operating DC Voltage UCPV | 1100 V | 1500V |
| Nominal Discharge Current (8/20 μ s) I_n | 20 kA | 20 kA |
| Total Discharge Current (8/20 μ s) I_{total} | 65 kA | 50 kA |
| Impulse Discharge Current (10/350) | 6,25 kA | 5 kA |
| Total Discharge Current (10/350 μ s) I_{total} | 6,25 kA | 5 kA |
| Specific Energy W/R | 9,77 kJ/ Ω | 6,25 kJ/ Ω |
| Charge | 3,125 As | 2,5 As |
| Maximum Discharge Current (8/20 μ s) I_{max} | 40 kA | 30 kA |
| Voltage Protection Level Up | 3,8 kV | 5 kV |
| Response Time tA | < 25 ns | |
| Number of Ports | 1 | |
| Thermal Protection | ✓ | |
| Short-Circuit Current Rating SCCR ISCPV | 11 kA | |
| Maximum Permitted DC Voltage VpvdC | 1100 V | 1500 V |
| Voltage Protection Rating VPR | 2500 V | 4000 V |
| Nominal Discharge Current (8/20 μ s) I_n | 20 kA | 20 kA |
| Short-Circuit Current Rating SCCR ISCPV | 50 kA | 65 kA |
| Operating Temperature Range Ta | - 40°C ... +85°C | |
| Permissible Operating Humidity RH | 5% - 95% | |
| Altitude (max) | 4000 m | |
| Operating State / Fault Indication | Green Flag / Not Green Flag | |
| Conductor Cross Section (max) | 35 mm ² (Solid, Stranded) / 25 mm ² (Flexible) | |
| Terminal Screw Torque Mmax | 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 | |
| Remote contacts - type ...RC | | |
| Contacts ratings | AC: 250V/1A; 125V/1A; DC: 48V/0,5A, 24V/0,5A, 12V/0,5A | |
| Terminal cross section | Max. 1,5 mm ² | |
| Terminal Screw Torque Mmax | 0,25 Nm | |
| Standards | EN 50539-11:2013+A1:2014 | |



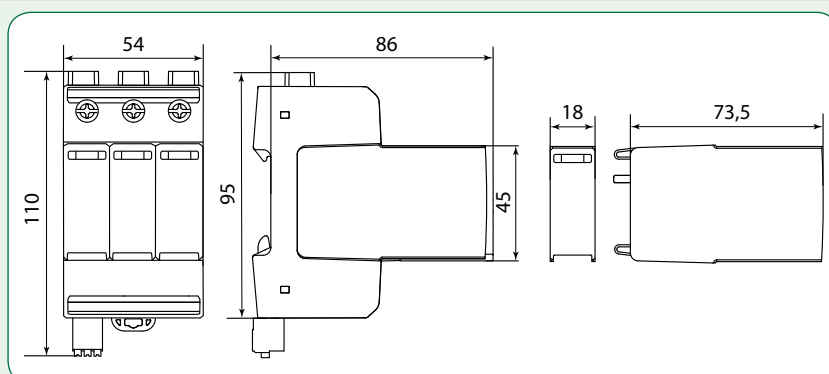
ETITEC EM T12 PV 1500/5 Y RC



ETITEC EM T12 PV ... Y



ETITEC EM T12 PV ... Y RC



NEW! acc. to EN 50539-11:2013

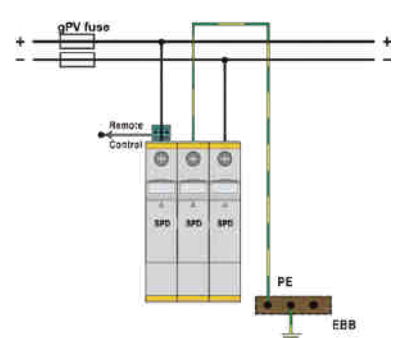
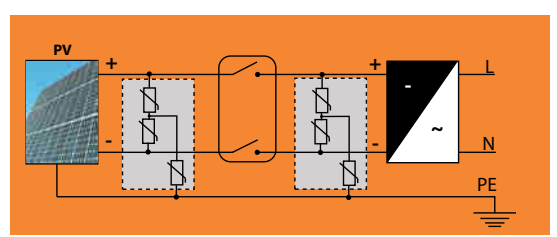
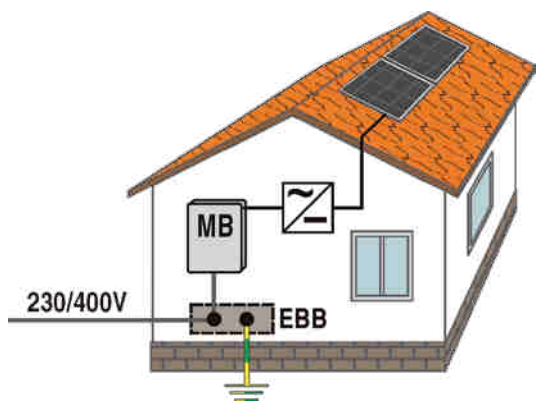
ETITEC (E)M T2 PV Y series of overvoltage surge protective devices has been developed to protect against indirect discharges and is intended to protect photovoltaic systems. The circuit topology consist of two (three) varistors stages each protected by a thermal disconnection device.

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

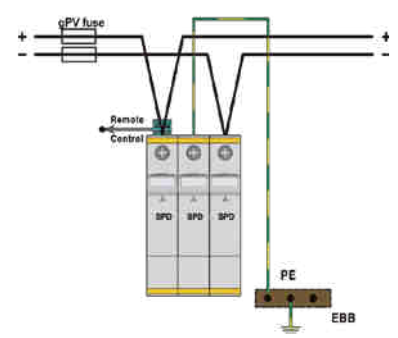
- Advantages:**
- optical indication of faulty device (green ok, red false)
 - remote signalisation (RC version only)
 - DIN rail mounting (EN 60715)
 - high discharge currents and high degree of protection
 - MOV varistor is the protective element
 - metal snapper, new way of mounting on DINrail (easier, quicker)
 - modular design
 - EN 50539-11:2013
 - RoHS compliant
 - connection up to 35mm²

Green protect - DC

ETITEC (E)M T2 PV Y for photovoltaic system on a building without 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.

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

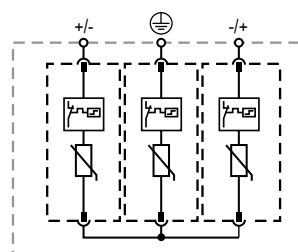
| Type | Code No. | Compatible with | Weight [g] | Packaging [pcs] |
|---------------------|-----------|-------------------------------|---------------|--------------------|
| MOD. M T2 PV 550/20 | 002440523 | ETITEC M T2 PV 1100/20 Y (RC) | 0,071 | 1/28 |
| MOD. M T2 PV 750/20 | 002440524 | ETITEC M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

Technical data

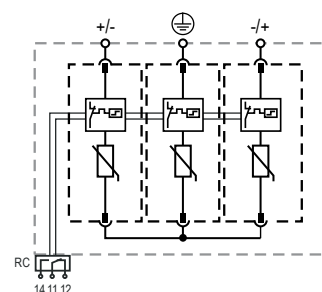
| Type | ETITEC M T2 PV 1100/20 Y | ETITEC M T2 PV 1500/20 Y |
|--|--|--------------------------|
| | T2 / II / C | |
| Maximum Continuous Operating DC Voltage U_{cpv} | 1100 V | 1500V |
| Nominal Discharge Current (8/20 μ s) I_n | 20 kA | 20 kA |
| Maximum Discharge Current (8/20 μ s) I_{max} | 40 kA | 30 kA |
| Total Discharge Current I_{total} | 50 kA | 40 kA |
| Voltage Protection Level U_p | < 3,8 kV | < 5 kV |
| Response Time t_a | < 25 ns | |
| Number of Ports | 1 | |
| Thermal Protection | ✓ | |
| Short-Circuit Current Rating SCCR I_{scpv} | 11 kA | |
| Operating Temperature Range T_a | - 40°C ... +85°C | |
| Permissible Operating Humidity RH | 5% - 95% | |
| Altitude (max) | 4000 m | |
| Operating State / Fault Indication | Green Flag / Not Green Flag | |
| Conductor Cross Section (max) | 35 mm ² (Solid, Stranded) / 25 mm ² (Flexible) | |
| Terminal Screw Torque M_{max} | 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 | |
| Remote contacts - type ...RC | | |
| Contacts ratings | AC: 250V/1A; 125V/1A; DC: 48V/0,5A, 24V/0,5A, 12V/0,5A | |
| Terminal cross section | Max. 1,5 mm ² | |
| Terminal Screw Torque M_{max} | 0,25 Nm | |
| Standards | EN 50539-11:2013+A1:2014 | |



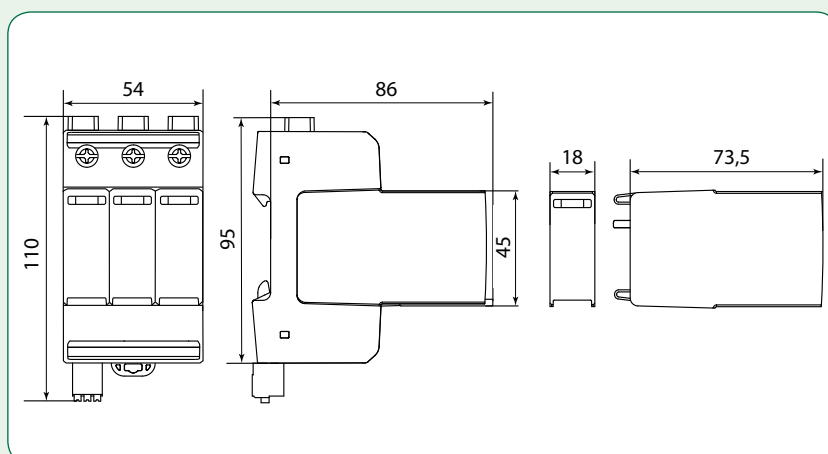
ETITEC M T2 PV 1500/20 Y RC



ETITEC M T2 PV ... Y

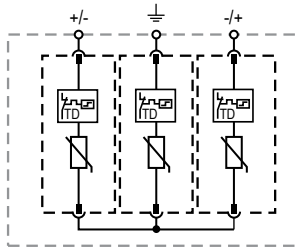


ETITEC M T2 PV ... Y RC

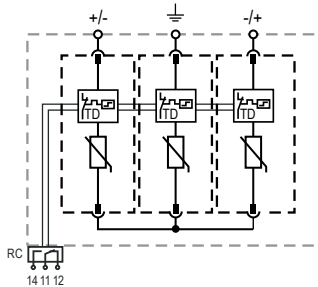




ETITEC EM T2 PV 1500/20 Y RC



ETITEC EM T2 PV ... Y



ETITEC EM T2 PV ... Y RC

ETITEC EM 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 EM T2 PV 1100/20 Y | 002440623 | 1100 | 9 | 20/40 | 329 | 1/5 |
| ETITEC EM T2 PV 1100/20 Y RC | 002440624 | 1100 | 9 | 20/40 | 333 | 1/5 |
| ETITEC EM T2 PV 1500/15 Y | 002440625 | 1500 | 9 | 15/40 | 358 | 1/5 |
| ETITEC EM T2 PV 1500/15 Y RC | 002440626 | 1500 | 9 | 15/40 | 363 | 1/5 |

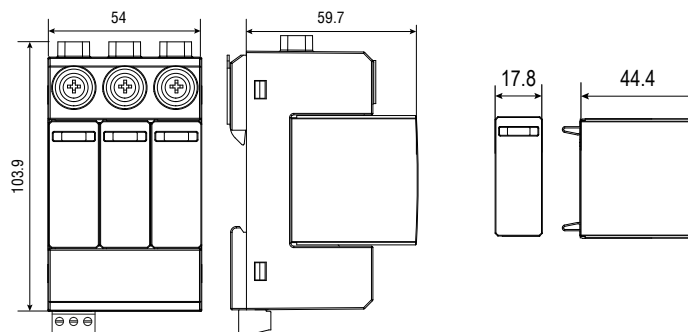
*RC - remote contact for remote signalisation of bad module (to be replaced)

Spare (replacement) modules

| Type | Code No. | Compatible with | Weight [g] | Packaging [pcs] |
|----------------------|-----------|--------------------------------|---------------|--------------------|
| MOD. EM T2 PV 550/20 | 002440627 | ETITEC EM T2 PV 1100/20 Y (RC) | 60 | 1/12 |
| MOD. EM T2 PV 750/20 | 002440628 | ETITEC EM T2 PV 1500/20 Y (RC) | 71 | 1/12 |

Technical data

| Type | ETITEC EM T2 PV 1100/20 Y | | ETITEC EM T2 PV 1500/15 Y | |
|--|--|----------|---------------------------|----------|
| | T2 / II / C | | | |
| Maximum Continuous Operating DC Voltage U_{cpv} | 1100 V | | 1500V | |
| Nominal Discharge Current (8/20 μ s) I_n | 20 kA | | 15 kA | |
| Maximum Discharge Current (8/20 μ s) I_{max} | 40 kA | | 40 kA | |
| Total Discharge Current I_{Total} | 40 kA | | 40 kA | |
| Voltage Protection Level U_p | (+)-(-) | < 4,2 kV | (+)-(-)-PE | < 4,8 kV |
| Response Time t_A | | < 25 ns | | |
| Thermal Protection | | ✓ | | |
| Number of Ports | | 1 | | |
| Short-Circuit Current Rating I_{scpv} | | 9 kA | | |
| Maximum Permitted DC Voltage V_{pdc} | 1000V | | 1500V | |
| Voltage Protection Rating VPR | 2500V | | 3000V | |
| Short-Circuit Current Rating SCCR | 50kA | | 65kA | |
| Operating Temperature Range T_a | - 40°C ... +85°C | | | |
| Permissible Operating Humidity RH | 5% - 95% | | | |
| Altitude (max) | 2000 m | | | |
| Operating State / Fault Indication | Green Flag / Not Green Flag | | | |
| Conductor Cross Section (max) | 35 mm ² (Solid) / 25 mm ² (Stranded) | | | |
| Terminal Screw Torque M_{max} | 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 | | | |
| Remote contacts - type ...RC | | | | |
| Contacts ratings | AC: 250V/1A; 120V/1A; DC: 48V/0,5A, 24V/0,5A, 12V/0,5A | | | |
| Terminal cross section | Max. 1,5 mm ² | | | |
| Terminal Screw Torque M_{max} | 0,25 Nm | | | |
| Standards | EN 50539-11:2013+A1:2014 | | | |

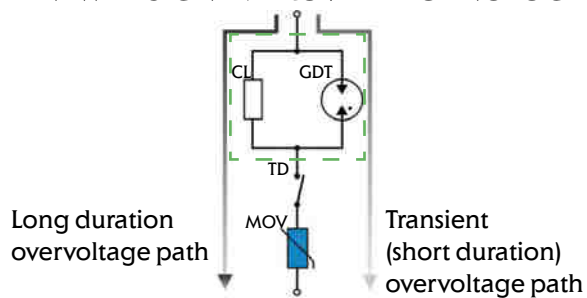




Advantages:

- 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
- Leakage current free technology!

NEW DESIGN-IMPROVED TECHNOLOGY

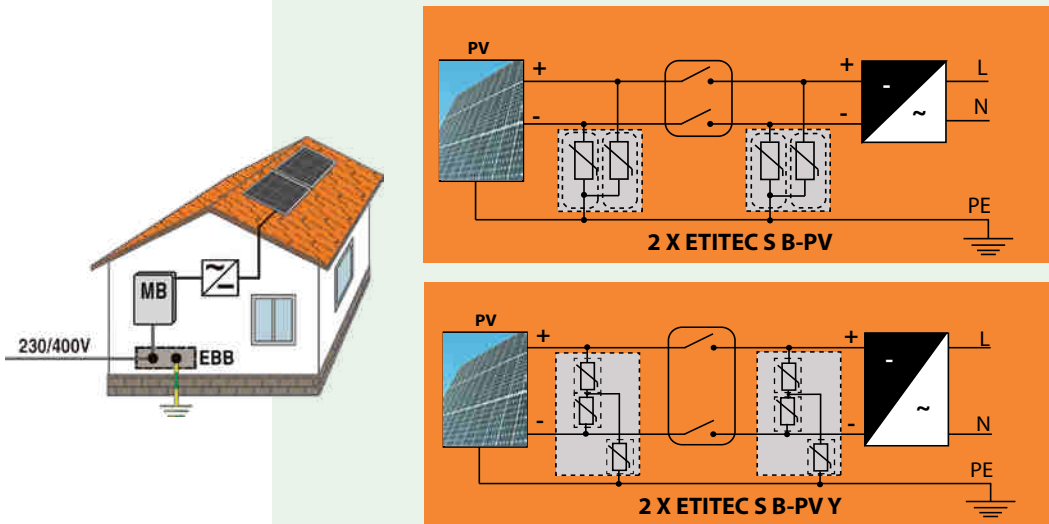


- Gas Discharge Tube - GDT
- Current Limiter - CL
- Thermal Disconnecter - TD
- Metal Oxide Varistor - MOV

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: $I_{imp} = 12,5 \text{ kA/pole}$ $I_{max} = 40 \text{ kA/pole}$ |
| 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 B - PV

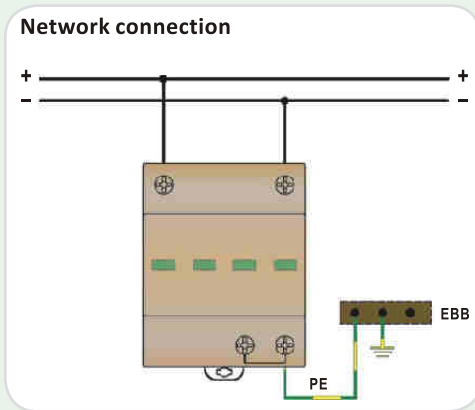
| Type | Code No. | U_{opv} [V DC] | I_{imp} [kA] | I_n/I_{max} [kA] | Weight [g] | Packaging [pcs] |
|------------------------------|-----------|------------------|----------------|--------------------|------------|-----------------|
| ETITEC S B-PV 300/12,5 | 002440258 | 300 | 12,5 | 20/40 | 147 | 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

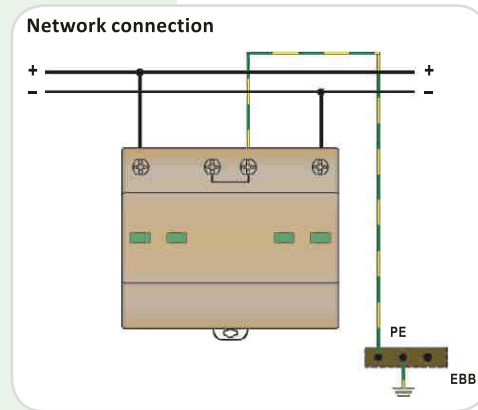
$U_c > 1,2 \times U_{ocstc}$ (open circuit voltage under standard test conditions)

LF - Leakage free version available upon request

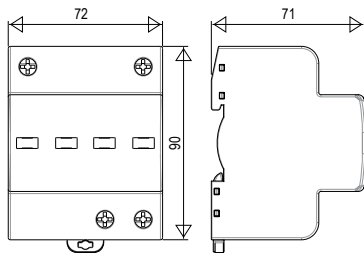
V configuration
ETITECS B-PV U_c/I_{imp}



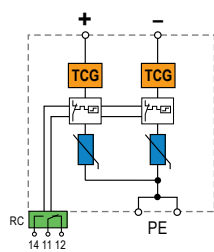
Y configuration
ETITECS B-PV U_c/I_{imp} Y



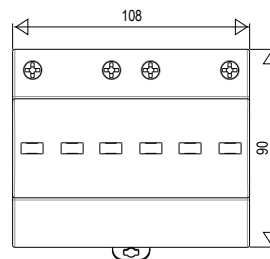
Dimensions



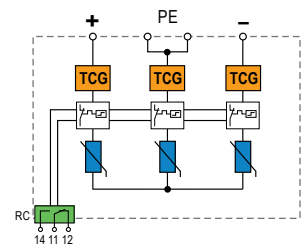
Internal configuration



Dimensions



Internal configuration



Technical data

| Type | ETITECS B-PV U _c /I _{imp} | | | ETITECS B-PV U _c /I _{imp} Y | | | |
|---|--|---------|---------|---|---------|---------|---------|
| | 300 | 600 | 1000 | 600 | 1000 | 1200 | 1500 |
| Electrical characteristics | | | | | | | |
| Max. continuous operating voltage U _{cpv} (DC) | 300V | 600V | 1000V | 600V | 1000V | 1200V | 1500V |
| Nominal discharge current I _n (8/20) | 20kA | | | 20kA | | | |
| Max. discharge current I _{max} (8/20) | 40kA | | | 40kA | | | |
| Impulse current I _{imp} (10/350) | 12,5kA | | | 12,5kA | | | |
| Short circuit withstand I _{scpv} | 200A | | | | | | |
| Protection level U _p | < 1.5kV | < 2.2kV | < 2.8kV | < 3.0kV | < 3.3kV | < 3.8kV | < 4.5kV |
| Residual voltage at I _{imp} U _{res} | < 1.3kV | < 2.0kV | < 2.6kV | < 3.0kV | < 3.3kV | < 3.8kV | < 4.5kV |
| Follow current I _f | x | | | | | | |
| Response Time tA t _A | < 25ns | | | | | | |
| Thermal protection | ✓ | | | | | | |
| Mechanical characteristics | | | | | | | |
| Temperature range | -40°C ... +80°C | | | | | | |
| Terminal Screw Torque Mmax | max. 4.5Nm | | | | | | |
| Terminal cross section | 35mm ² (solid)/25mm ² (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 ² | | | | | | |
| Remote terminal torque | 0.25Nm | | | | | | |

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_{cgv} [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)

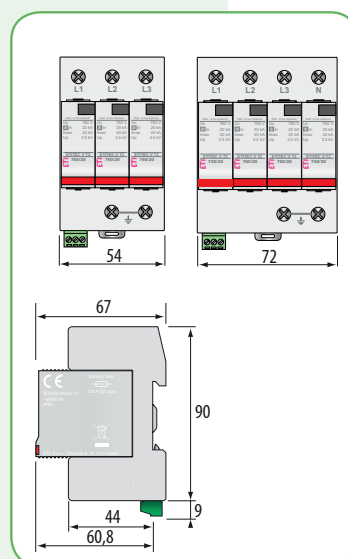
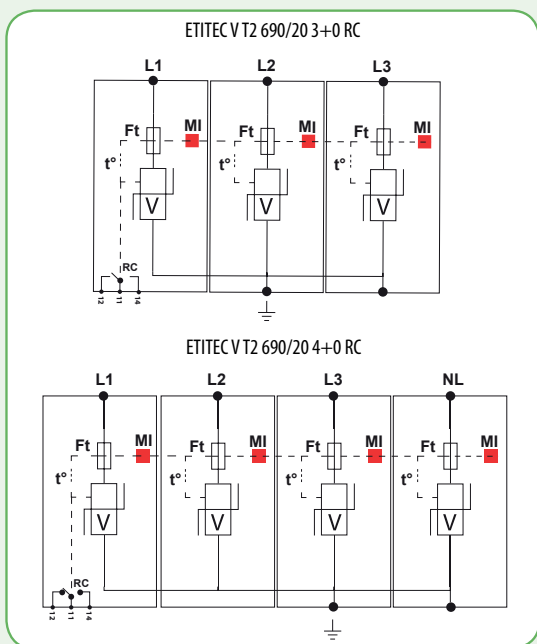
p - number of poles with varistors MOV

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 ² / 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.



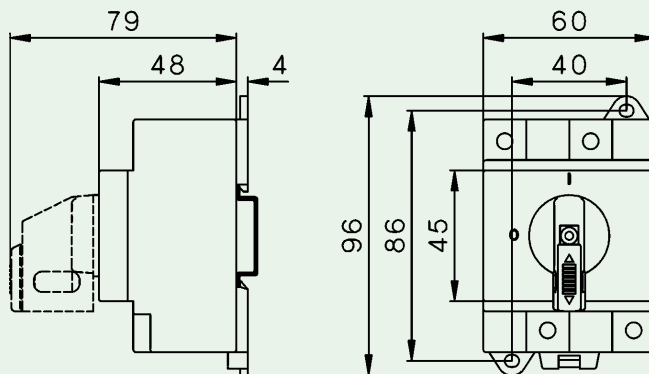
General characteristics

| | |
|---------------|---|
| 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 |

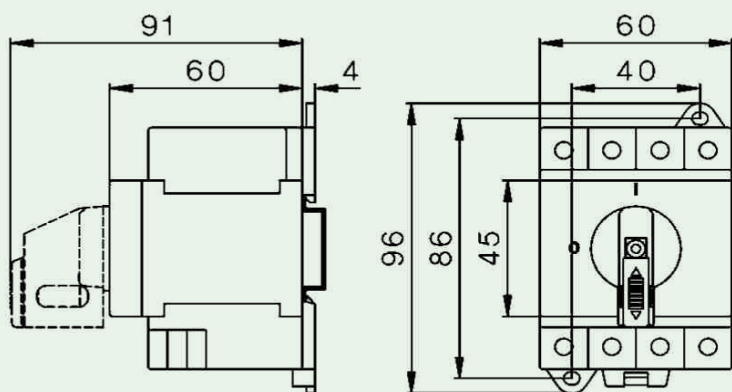
PV switch disconnector for photovoltaic systems

| 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 |

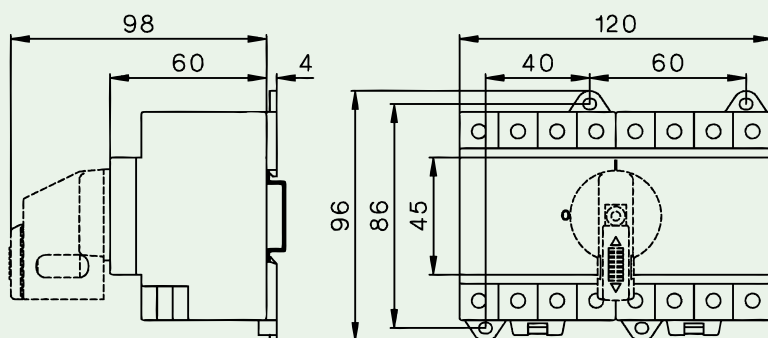
Switch disconnectors "LS.." are switch gears for interrupting DC/AC-inverter from the solar-panels. Photovoltaic-installations have to be equipped with DC-isolators according to IEC 60364-7-712.
*Insulated Jumper



LS16, 25, 32 2p



LS16, 25, 32 4p



LS32 A4+2

| | | LS16 [A] | LS25 [A] | LS32 [A] | DC22B | LS16 [A] | LS25 [A] | LS32 [A] | |
|--|---|----------|----------|----------|-------|----------|----------|----------|---|
| | 2 pole in series A2 | 500V | 16 | 25 | | 32 | 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

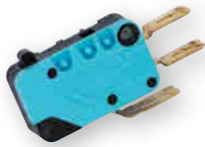
| Type | Code No. | Description | For use with | Weight [g] | Packaging [pcs] |
|-------------|-----------|---------------------|--------------------------------|------------|-----------------|
| LBS-DH630/B | 004661481 | Direct handle black | LBS100-500DC (1000V, 1500V) | 100 | 1/25 |
| LBS-DH630/R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

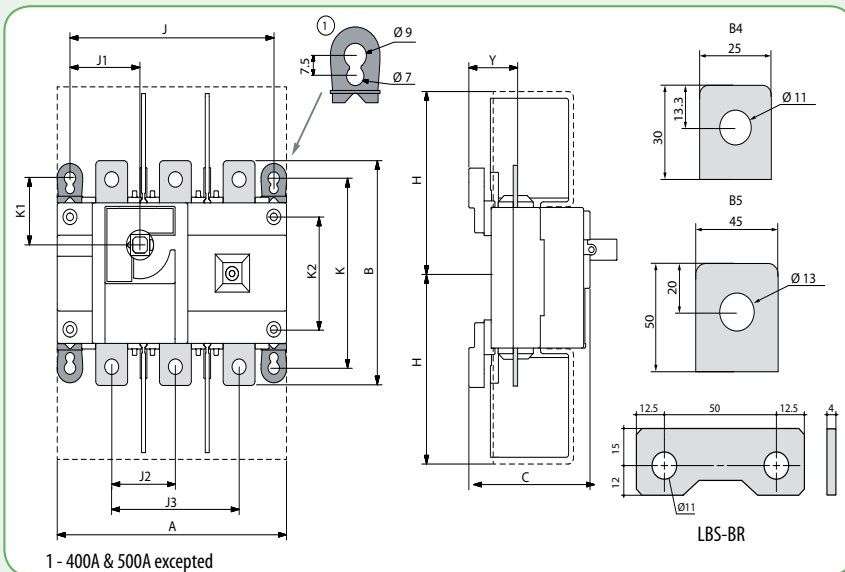
| Type | Code No. | Description | For use with | Weight [g] | Packaging [pcs] |
|----------|-----------|------------------------|------------------------|------------|-----------------|
| LBS-PS11 | 004661499 | Auxiliary contact (CO) | LBS ... DC1000, DC1500 | 26 | 1/30 |

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 | | | | |
| Connection | | | | | | | | | | |
| Nominal Cu cable section | | 35 mm ² | | | | 70 mm ² | | | | |
| Nominal Cu busbar width | | 32 mm | | | | 32 mm | | | | |
| Max Cu rigid cable cross-section | | 35 mm ² | | | | 70 mm ² | | | | |
| 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 | | | | | | | | |
| Power dissipation per poles of the PV switch (W/P) @ 40°C | | 0,8 | | | | 2 | | | | |

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 | | | | | | | |
| Connection | | | | | | | | | | |
| Nominal Cu cable section | 120 mm ² | | 185 mm ² | | | | | | | |
| Nominal Cu busbar width | 32 mm | | 32 mm | | | | | | | |
| Max Cu rigid cable cross-section | 120 mm ² | | 185 mm ² | | | | | | | |
| 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 | | 10000 | | | | | | | |
| Operating effort | 10 Nm | | 10 Nm | | | | | | | |
| Weight of a 2 pole device | 1,8 kg | | - | | | | | | | |
| Weight of a 3 pole device | - | | 6 kg | | | | | | | |
| Power dissipation per poles of the PV switch (W/P) @ 40°C | 4,7 | | 5,5 | | | | | | | |

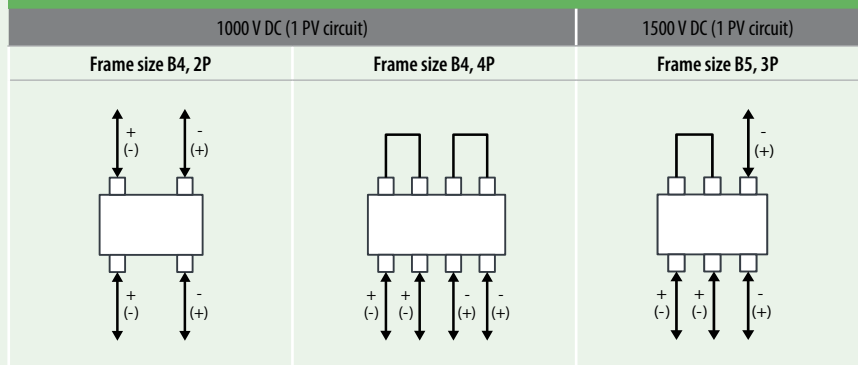


| Frame size | Nr. Of poles | Dimensions (mm) | | | | | | | | | | | |
|------------|--------------|-----------------|-----|-------|-------|-----|-----|----|-----|-----|------|----|------|
| | | A | B | C | H | J | J1 | J2 | J3 | K | K1 | K2 | Y |
| B4 | 2 | 180 | 160 | 95 | 132,5 | 160 | 55 | - | 100 | 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 |

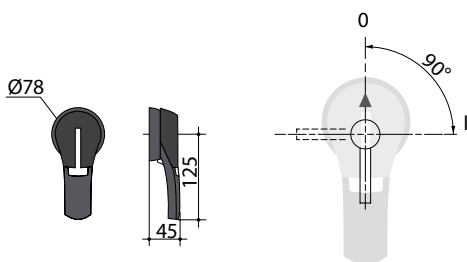
Technical data (according to IEC 60947-3):

| 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 | |
| Connection | | | | | | | | | | | |
| Nominal Cu cable section | | | | 240 mm ² | | | 2x150 mm ² | | | | |
| Nominal Cu busbar width | | | | 32 mm | | | 32 mm | | | | |
| Max Cu rigid cable cross-section | | | | 240 mm ² | | | 2x150 mm ² | | | | |
| 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 | | | | |
| Power dissipation per poles of the PV switch (W/P) @ 40°C | | | | 20@DC1000/8@DC1500 | | | 30 | | | | |

* 1500 V DC rated insulation voltage only for switch 004661859

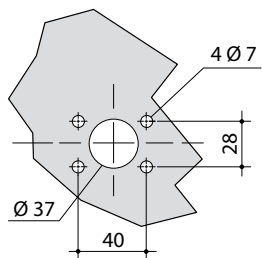
Pole connections in series LBS DC


Handle type LBS-EH630

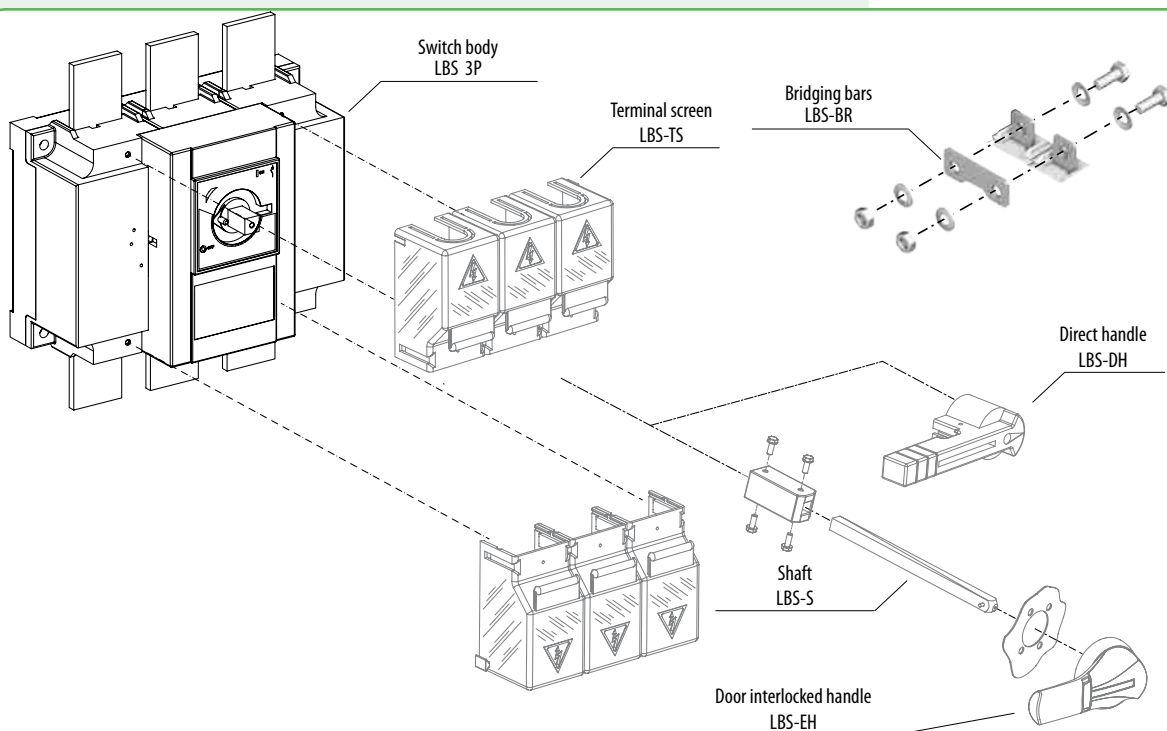
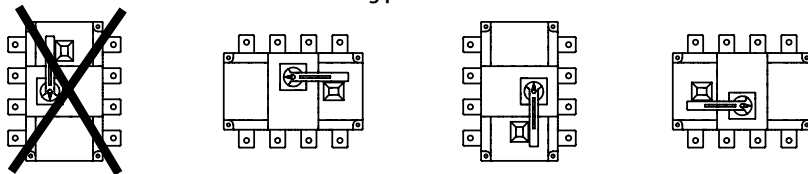


Direct front operation

Door drilling



Mounting position LBS DC



IP65 Wall mounted distribution boards ECH

Available in 4, 8, 12, 24, 36 modules

Applications:

Watertight wall-mounted distribution boards apply in domestic and industry architecture for mounting modular equipment for protection (IP65) against wet, dust and another dirtiness

Structure:

Enclosure is made of high thermal stability material - ASA (Acrylonitrile-Acrylic-Styrene), plastic with good dielectrical and mechanical attributes, UV resistant (colour stability)

Advantages: Aesthetic and attractive look, easy and quick montage

Main elements:

- Bottom cover with DIN rail, PE and N bars and holes for PG cable inlets properly marked
- Top cover with seal of the door
- Transparent door made of polycarbonate (PC) with plastic lock (in standard) or metal lock with key (in option)



Technical data:

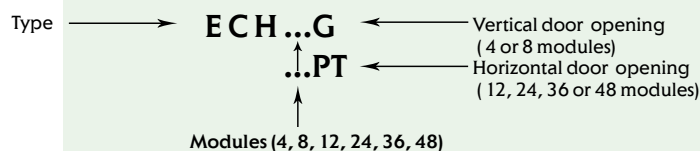
| | |
|-------------------|---------------------|
| Protection class | IP65 |
| Isolation class | II |
| Impact kit | IK07 |
| Nominal voltage | 400V AC / 1500 V DC |
| Temperature range | -25 °C do +60 °C |
| IEC compatibility | IEC- 60670-24 |

| Type | Code number | Description | Number of terminals at PE /N | Dimensions [H x W x D] (mm) | Weight (kg) | Packaging (pcs.) |
|----------|-------------|---|------------------------------|-----------------------------|-------------|------------------|
| ECH-4G | 001101060 | Wall mounted enclosure 4 mod, IP-65 transparent door | 4/4 | 201x128x120 | 0,46 | 1/5 |
| ECH-8G | 001101061 | Wall mounted enclosure 8 mod, IP-65 transparent door | 8/8 | 201x202x120 | 0,68 | 1/5 |
| ECH-12PT | 001101062 | Wall mounted enclosure 12 mod, IP-65 transparent door | 10/10 | 256x319x144 | 1,24 | 1/5 |
| ECH-24PT | 001101063 | Wall mounted enclosure 24 mod, IP-65 transparent door | 15/15 | 384x319x144 | 1,7 | 1/5 |
| ECH-36PT | 001101064 | Wall mounted enclosure 36 mod, IP-65 transparent door | 15/15 | 535x319x144 | 2,31 | 1/5 |
| ECH-48PT | 001100304 | Wall mounted enclosure 48 mod, IP-65 transparent door | 20/20 | 664 x 319 x 141 | 3,22 | 1/5 |

Accessories

| | | | | | | |
|---------|-----------|-----------------------|---|---|-------|---|
| ECH-L2K | 001100204 | Lock with key for ECH | - | - | 0,017 | 1 |
|---------|-----------|-----------------------|---|---|-------|---|

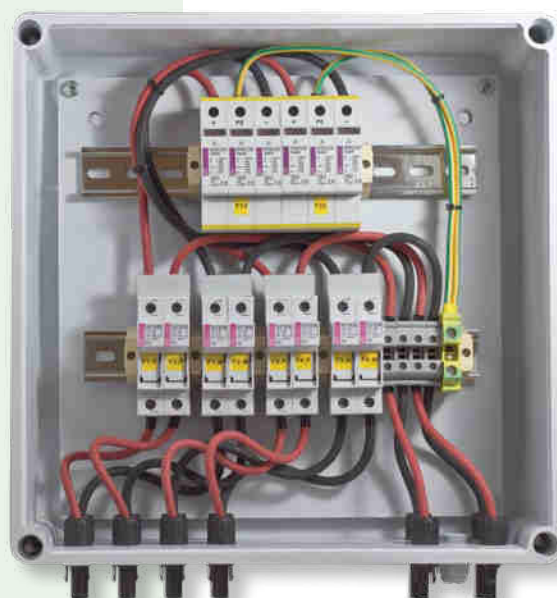
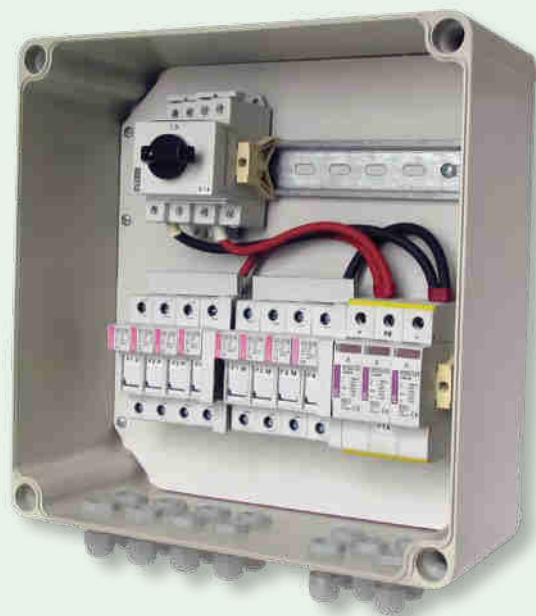
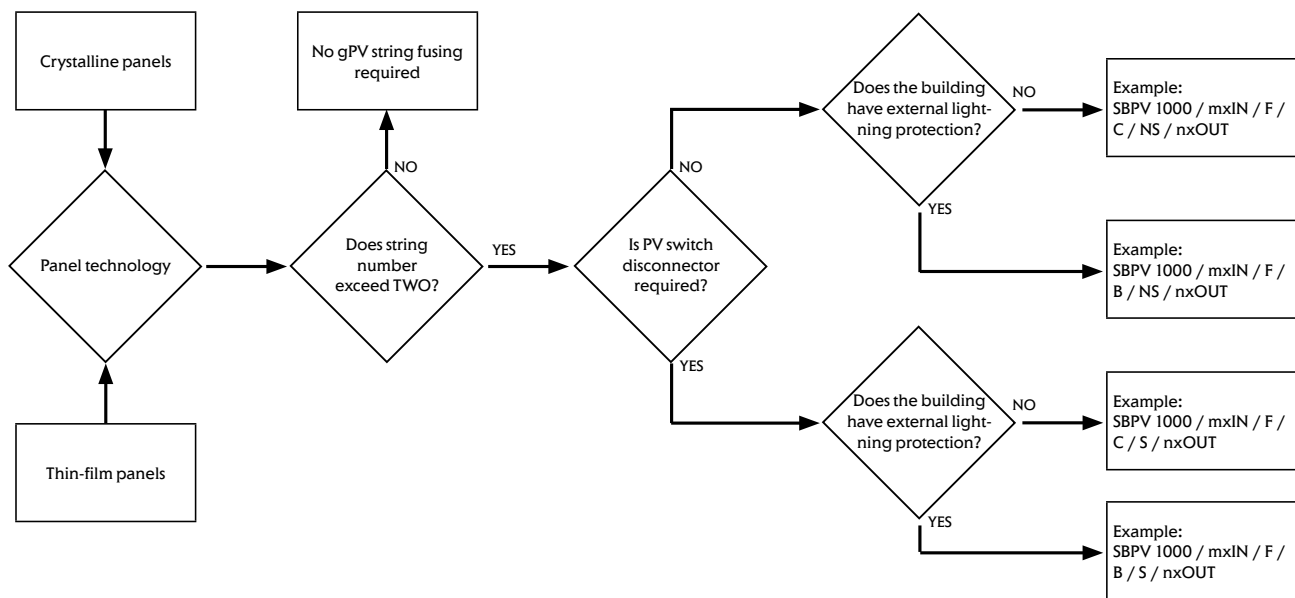
Enclosure designation



Ready made DC-junction boxes

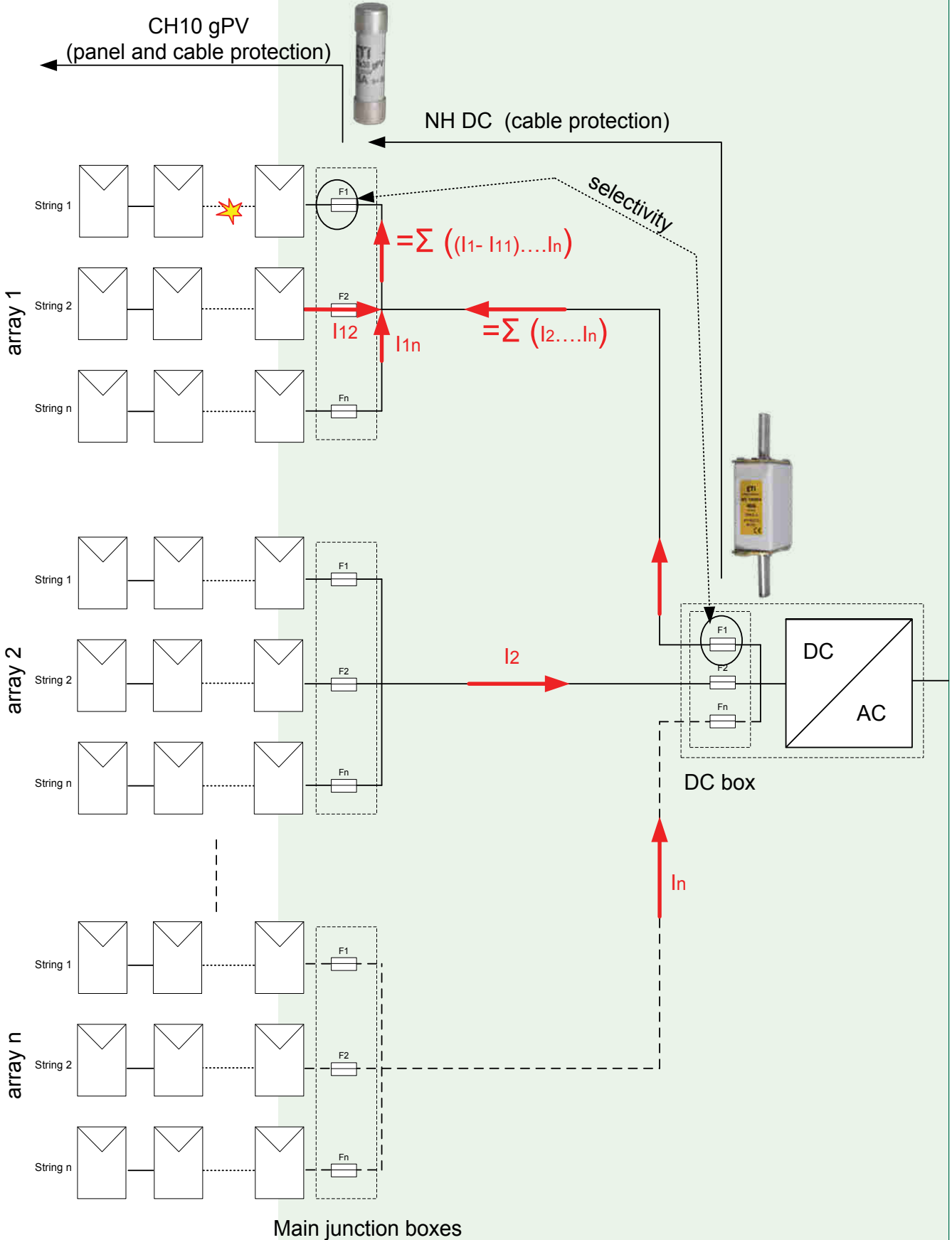
For more technical, ordering and other information, please see our catalogue [Solutions](#)

How to choose correct protection for PV junction boxes

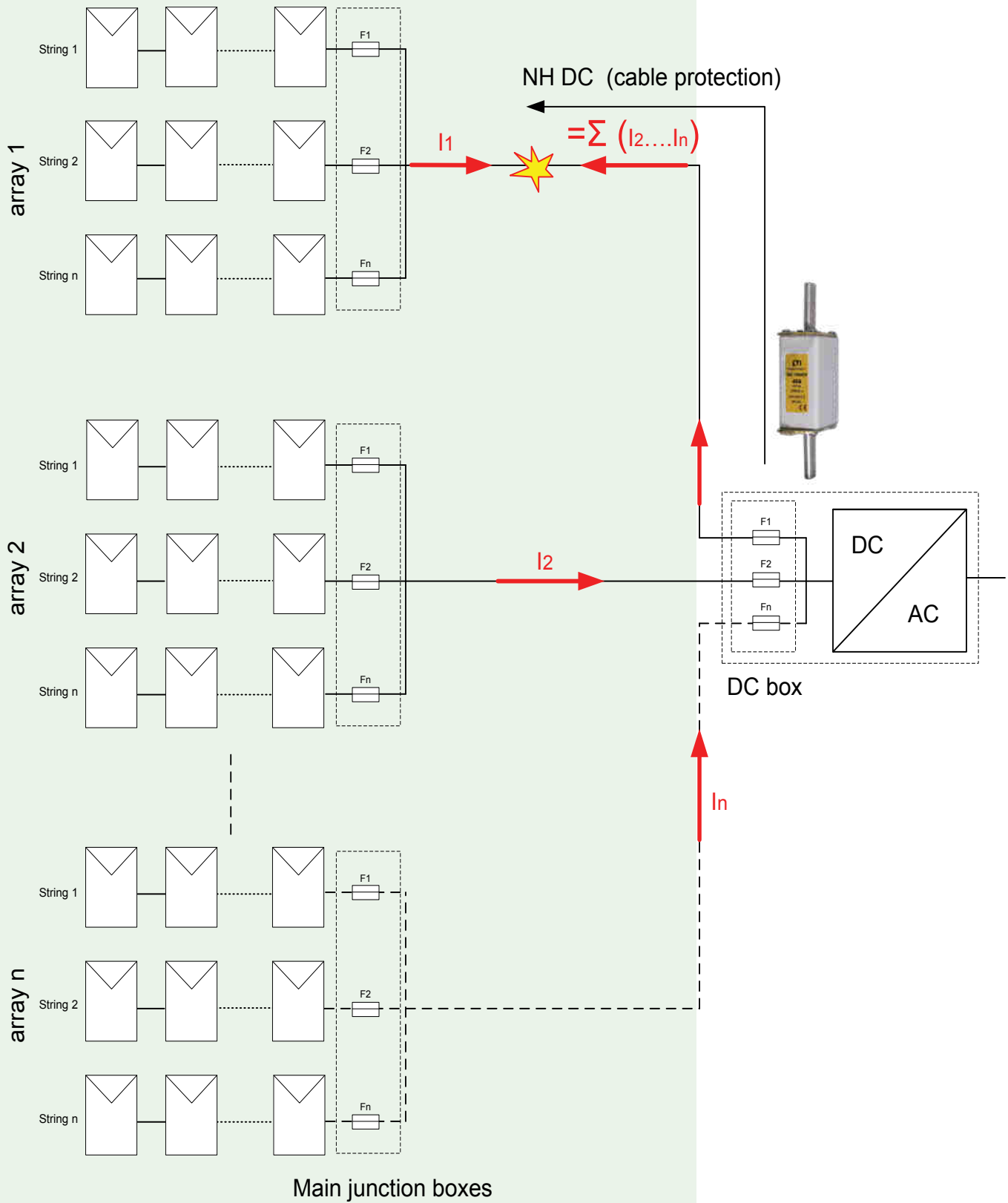


Enclosures

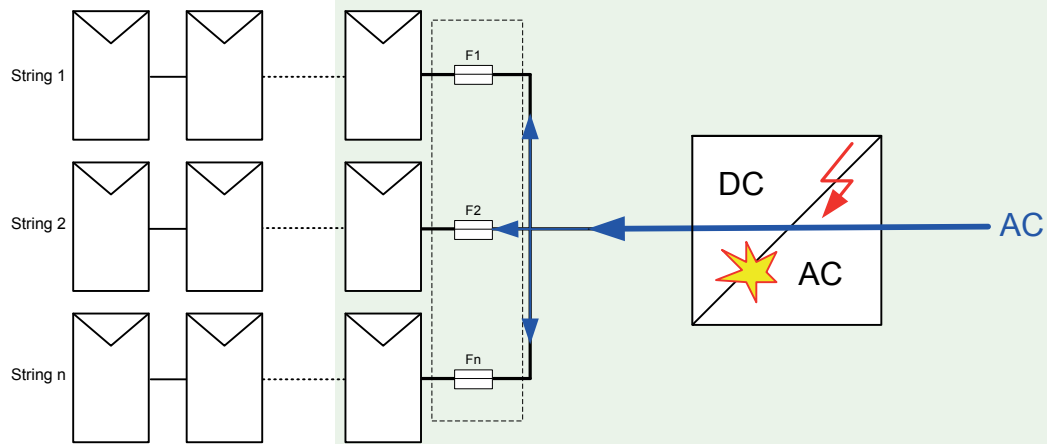
Protection of PV modules on REVERSE current by CH gPV fuse link



Protection of the wiring between ARRAYS from short-circuit



Protection from »AC REVERSE current« (transformerless inverter)



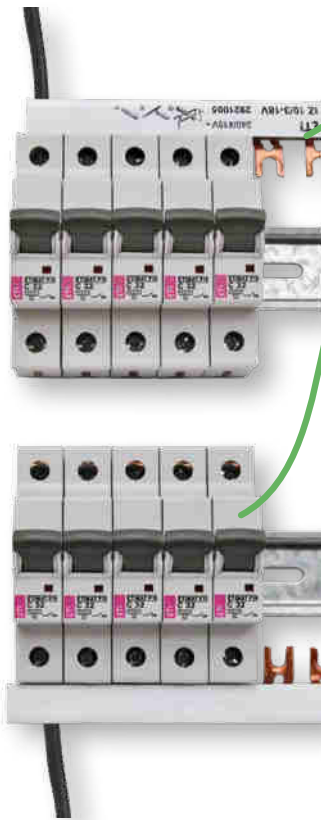
AC - distribution and protection components

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:

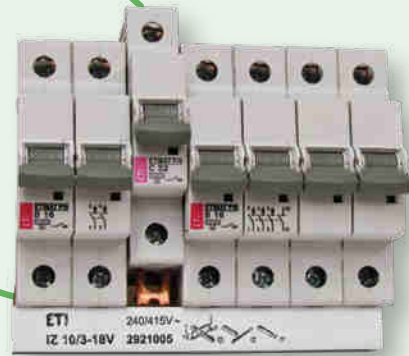
- top
- bottom



→ 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



→ Indication of contacts' state

→ Sealing possibility in ON and OFF position



→ Locking device



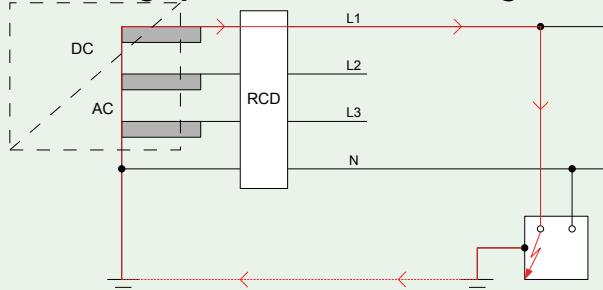
→ Better protection of terminals against touching the parts under voltage

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

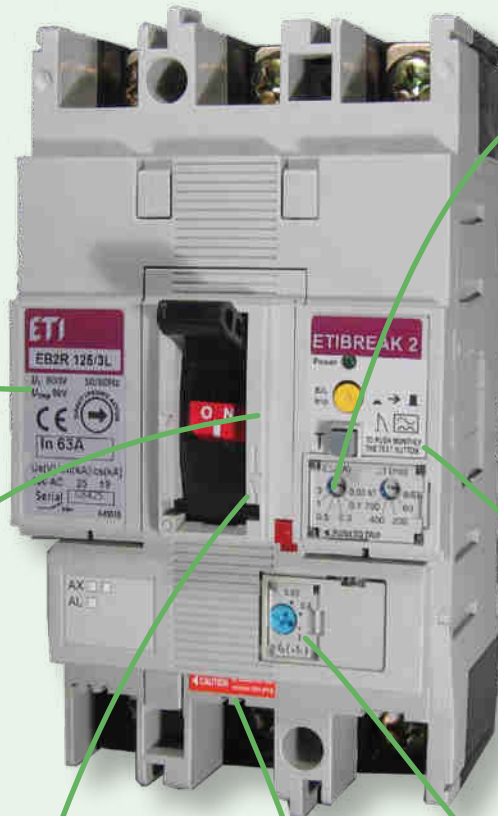
ETICON power contactors are used as separation device actuated on anti-islanding protection signal between photovoltaic inverter and AC utility grid. For the same purpose ETIBREAK moulded case circuit breakers series EB2 assembled with motor operators enabling remote controlled operations can be used. 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)



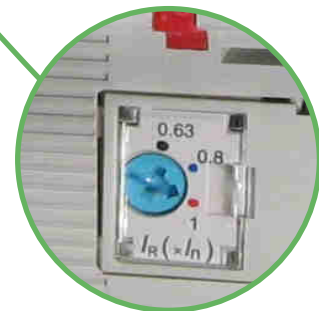
Type A: Tripping is ensured for residual sinusoidal AC in the presence of residual pulsating DC.



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

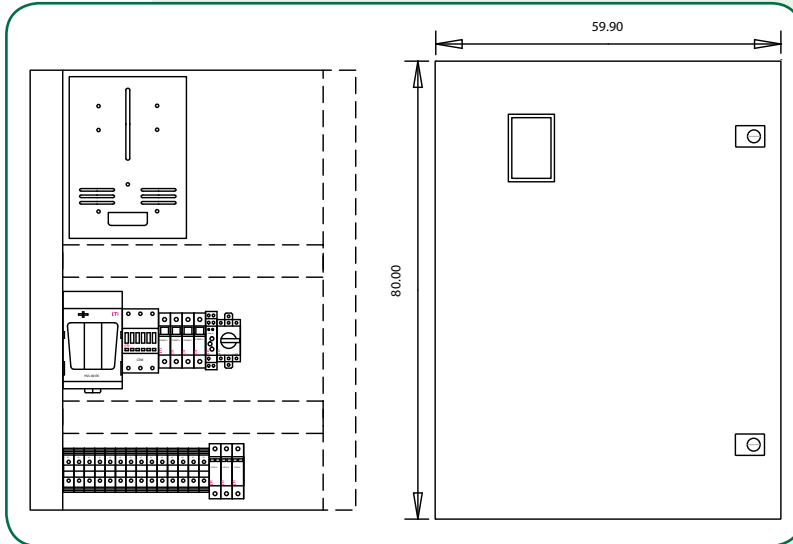
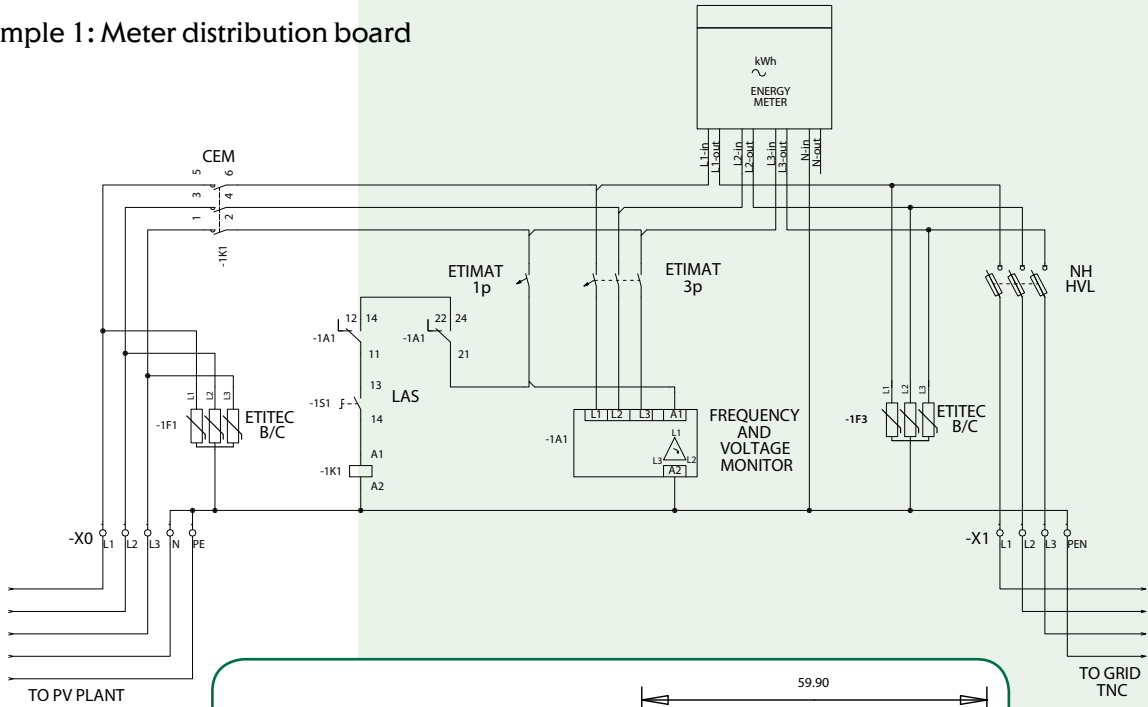


AC collector



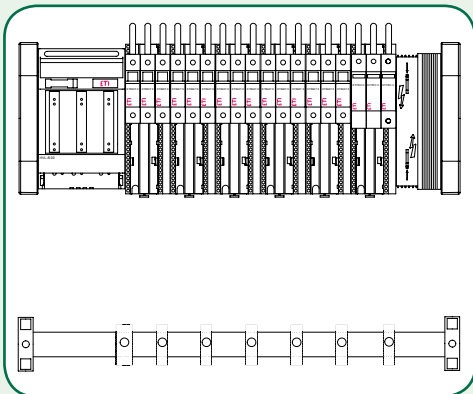
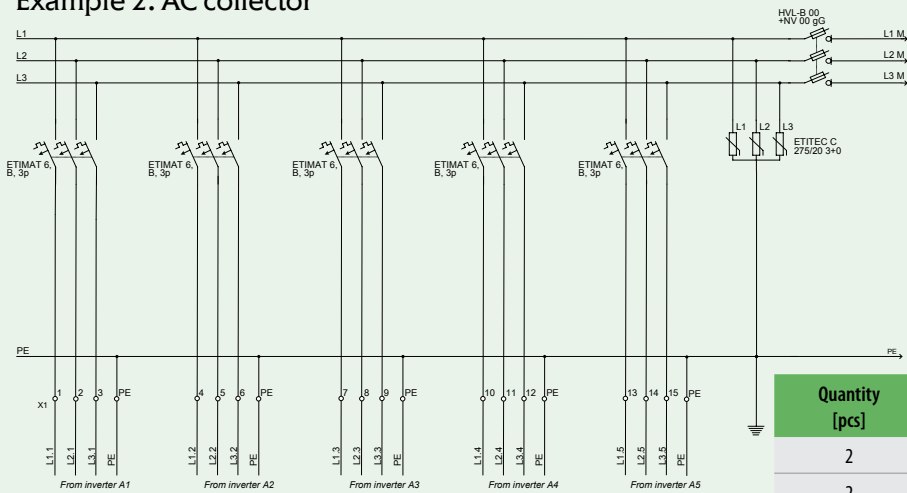
Solutions

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 | 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 |

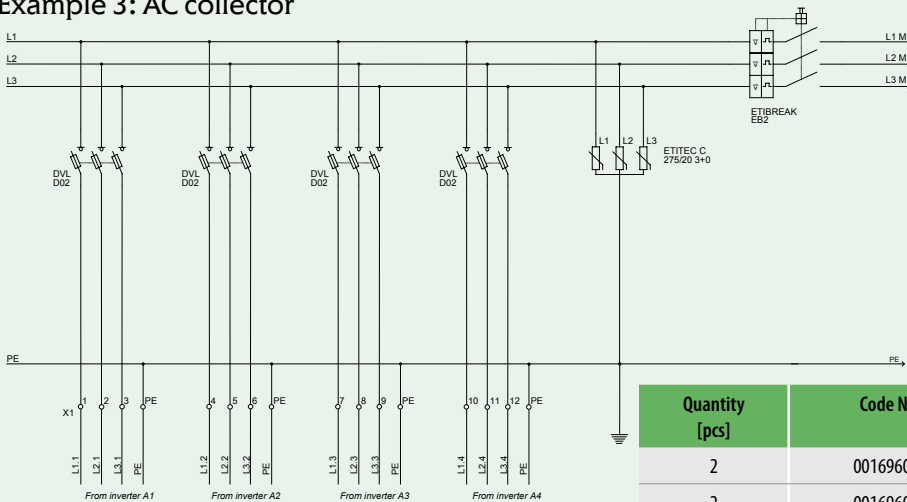
Example 2: AC collector



| 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

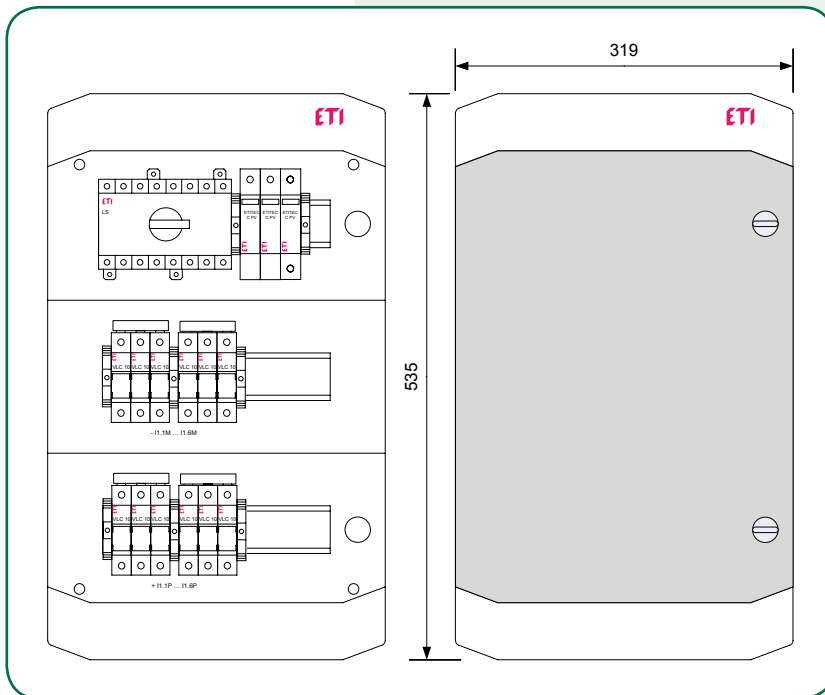
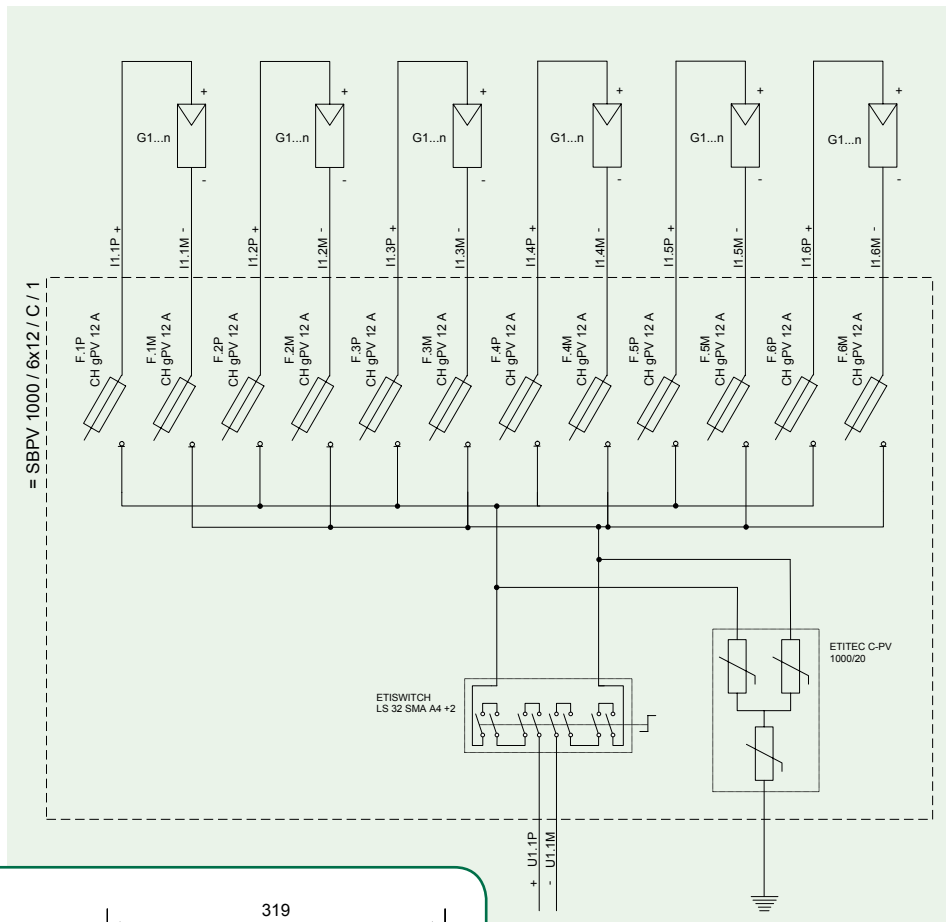
Example 3: AC collector



| 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

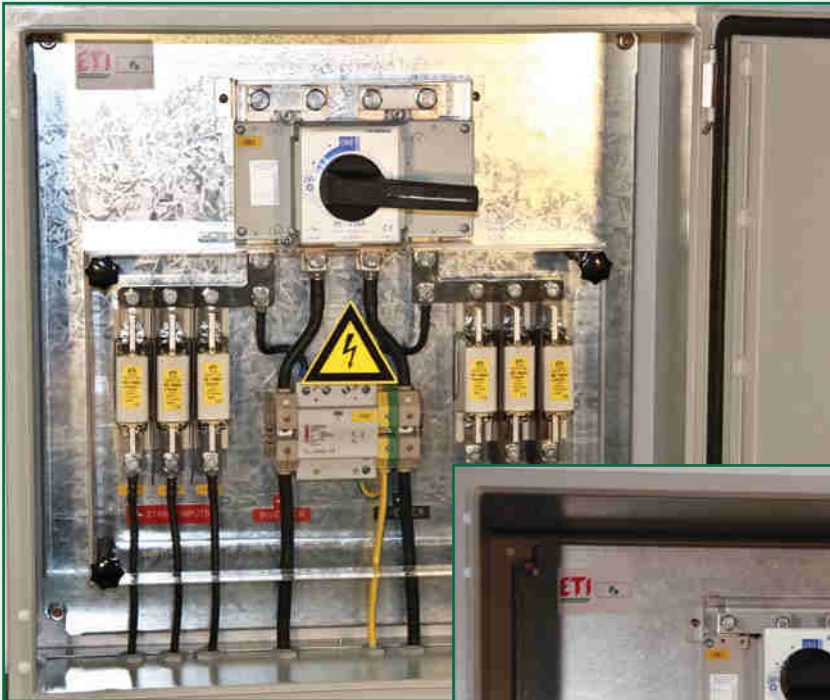
Example 4: DC junction box



| 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

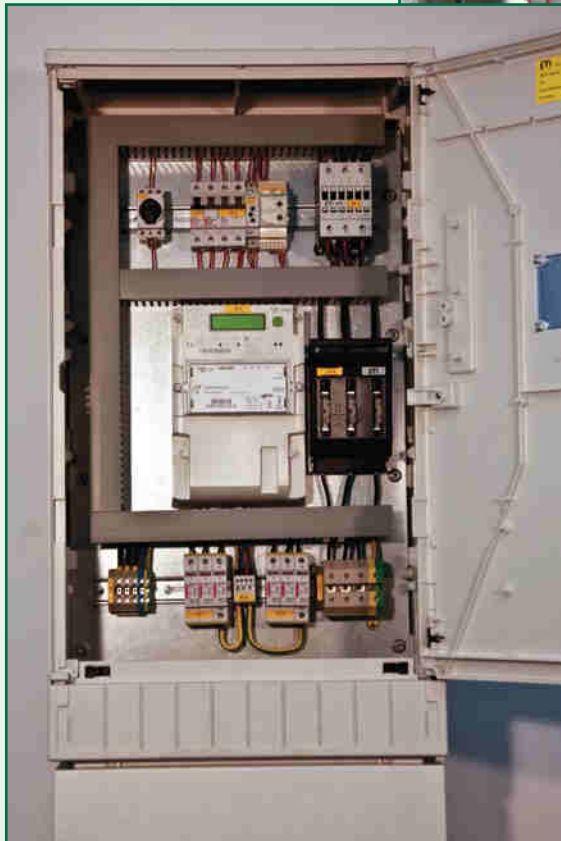
DC junction box (NH gPV fuses)



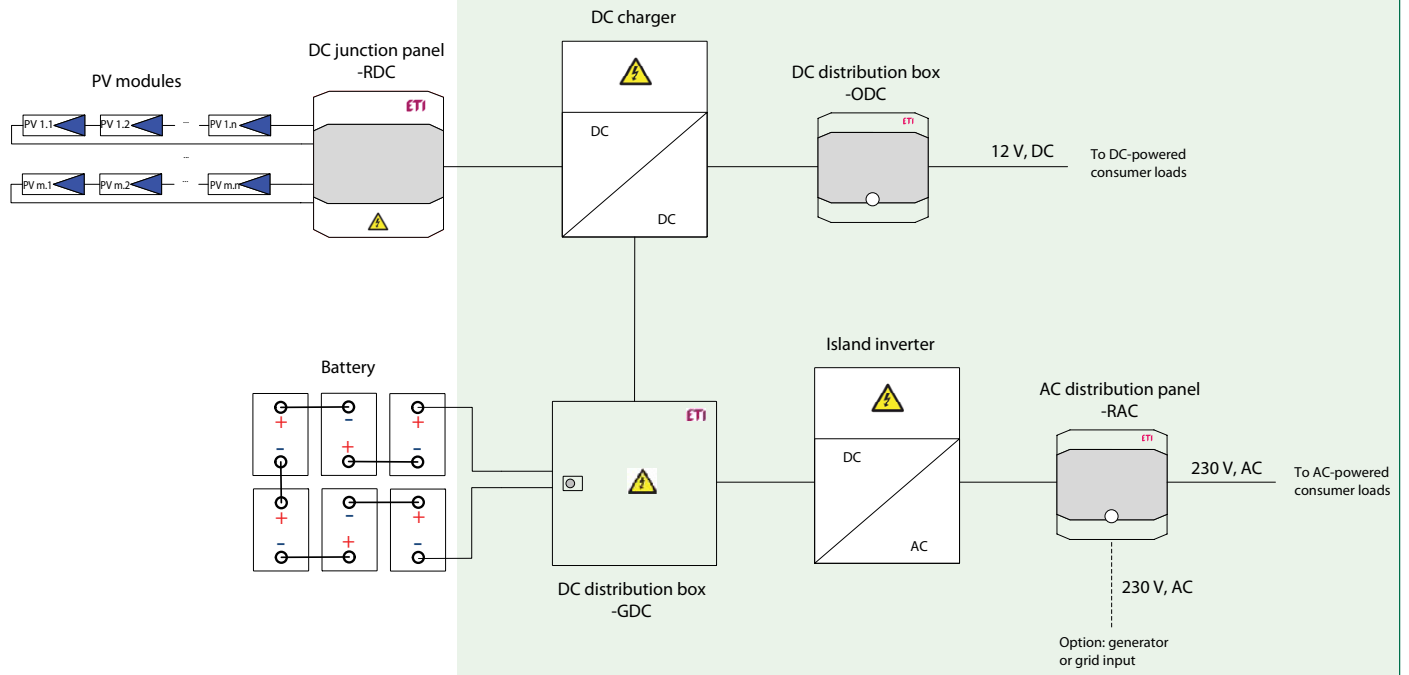
DC junction box (CH gPV fuses)



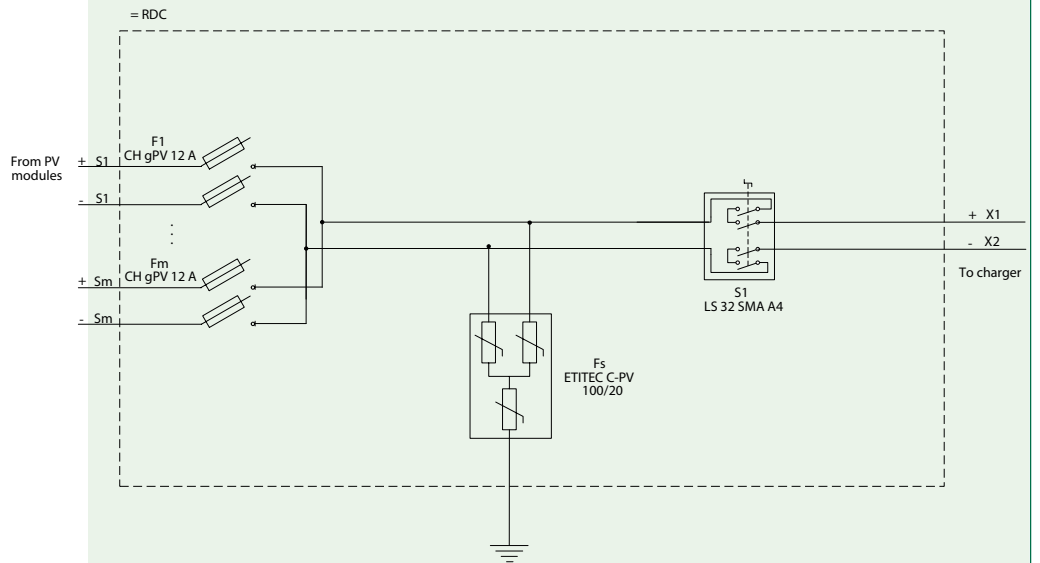
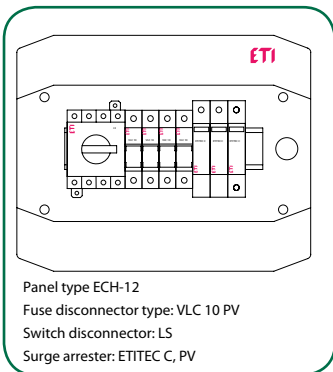
Meter distribution cabinet



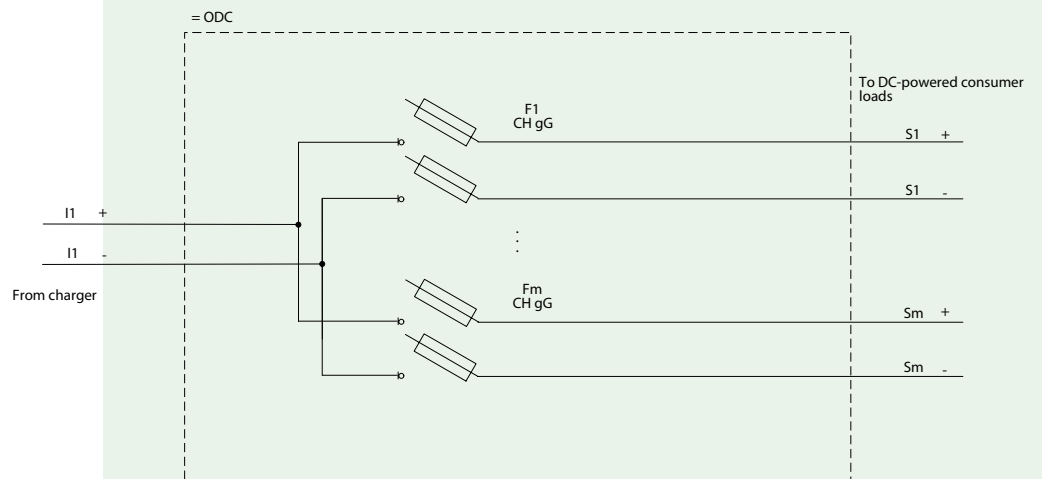
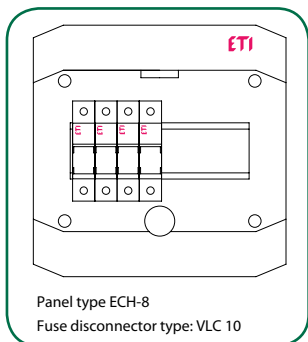
PV off-grid system protection



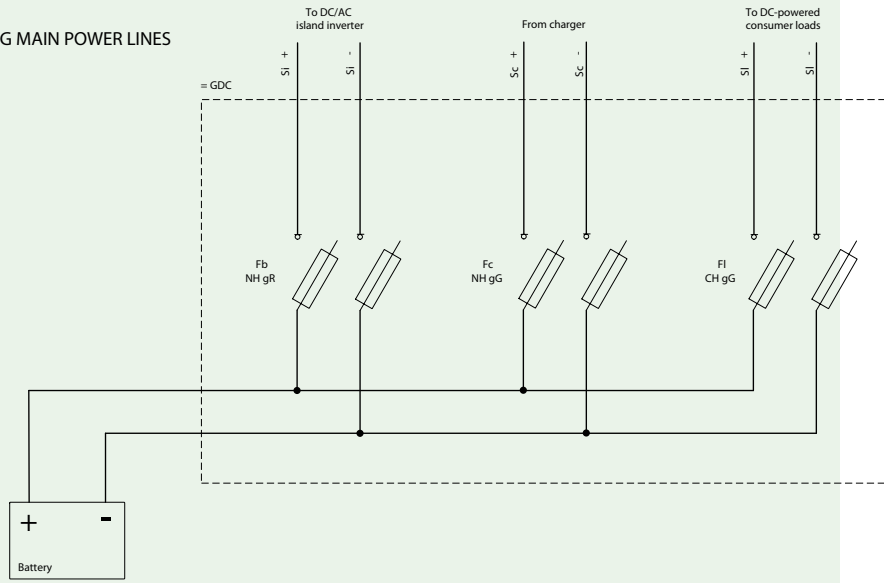
PROTECTING DC SIDE OF ISLAND PV PLANT.



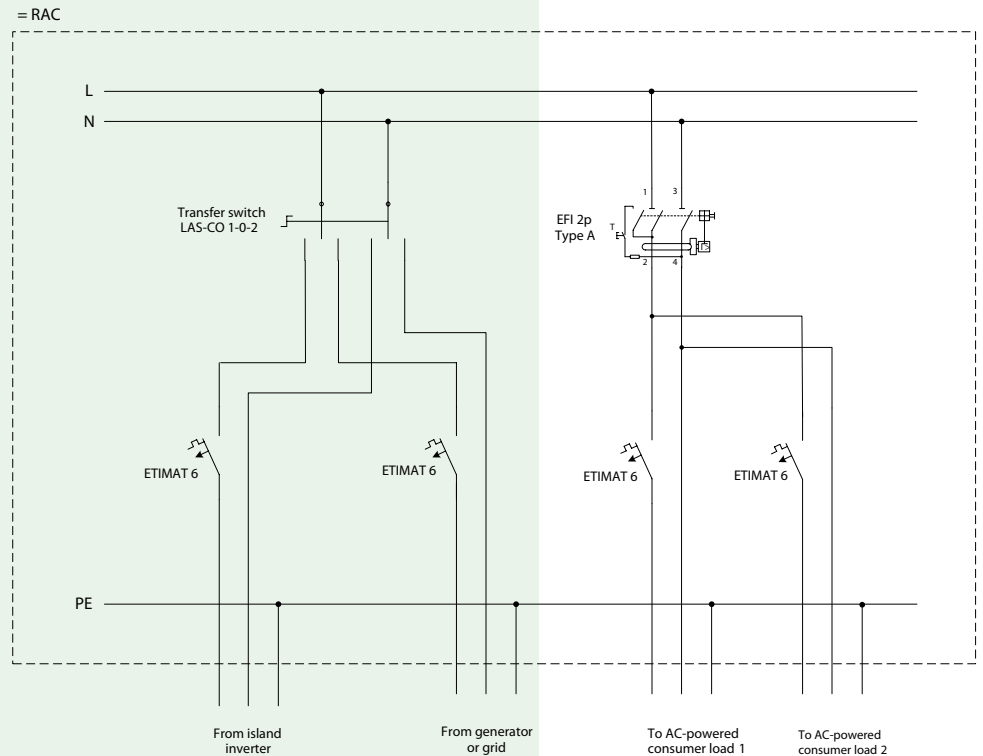
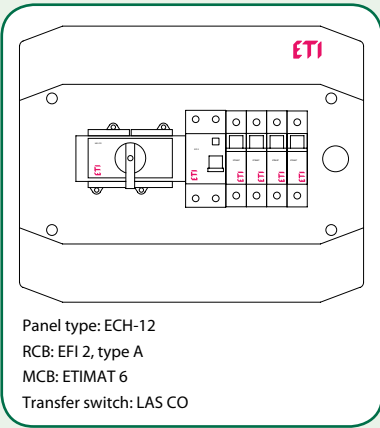
PROTECTING DC-POWERED CONSUMER LOADS DIRECTLY FROM CHARGES.



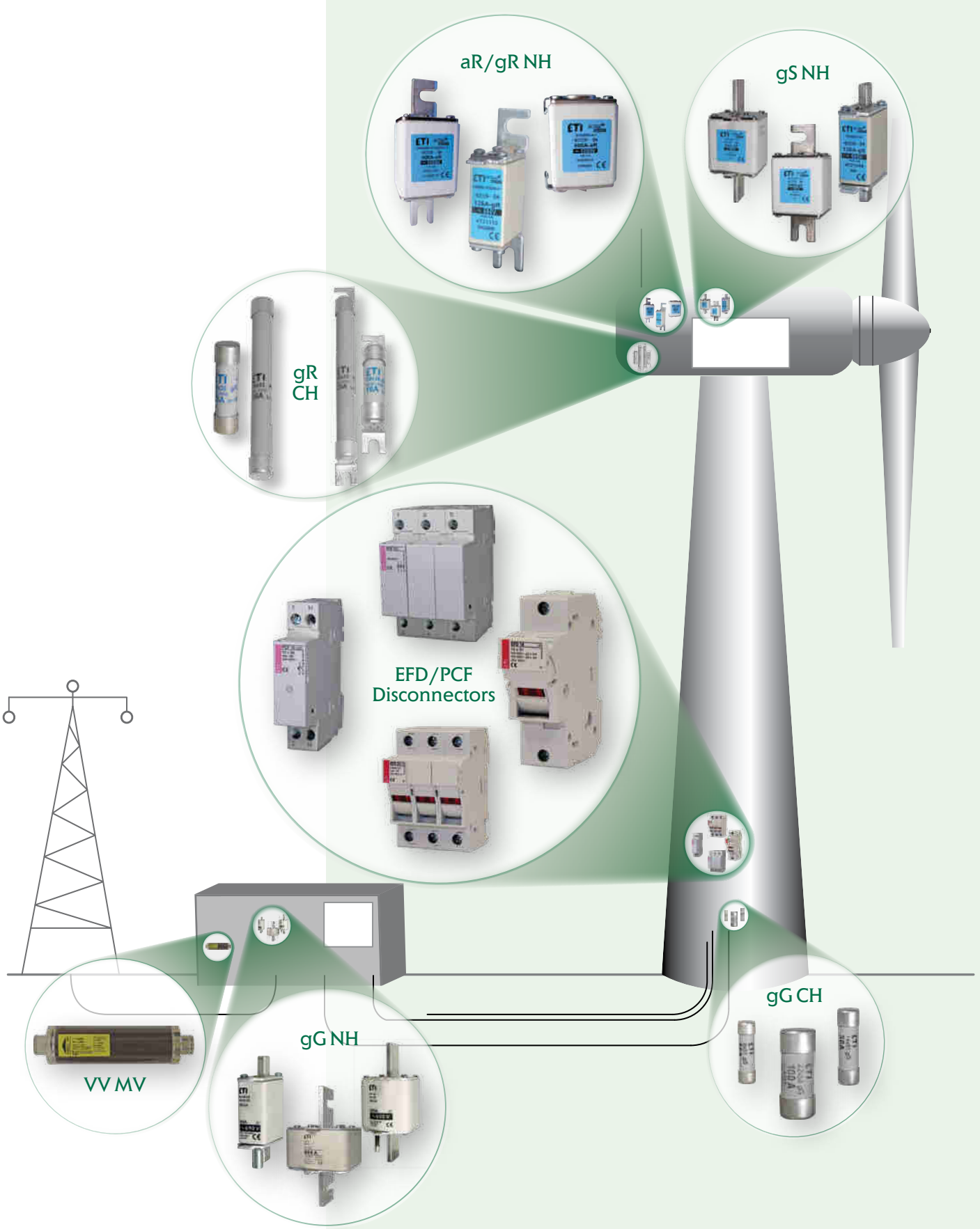
PROTECTING MAIN POWER LINES



AC DISTRIBUTION BOX



Overcurrent Protection for Wind Power Generation



index

| Code No | Page |
|-------------------|------|
| 0011 | |
| 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 |
| 0016, 0017 | |
| 001691062 | 52 |

| Code No | Page |
|-------------|------|
| 001703005 | 19 |
| 0024 | |
| 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 |
| 0025 | |
| 002540201 | 15 |
| 002540203 | 15 |

| 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 |
| 0026 | |
| 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 |
| 0029 | |
| 002921101 | 20 |

index

| Code No | Page |
|-------------|------|
| 002921111 | 20 |
| 002921121 | 20 |
| 0041 | |
| 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 |

