Protecting and Disconnecting in Photovoltaic Systems.

Product Information
AC/DC switching and protection devices
Photovoltaic switchgear.
From small houses to large-scale systems.

Photovoltaic power plants convert sunlight directly into electrical energy. Photovoltaic cells are used for this purpose. Photovoltaic power is a renewable energy source which is used primarily in domestic and public buildings as well as open spaces. A differentiation is made between grid-independent systems and systems coupled to the power grid. Power grid coupled photovoltaic systems feed the generated power directly into the electrical grid. There is no need for sophisticated intermediate storage. A system of this type consists of photovoltaic cells, one or more inverters and switchgear for operation, maintenance and protection in the event of a fault. This is why photovoltaic systems coupled to the grid require very reliable and safe individual components.

Reliable grid disconnection devices

Inverters convert the DC current from the photovoltaic cells to AC current. The frequency and voltage characteristics are adapted to those of the public power grid. Reliable protection and main switches ensure safe operation. Moeller offers the right solutions here: For integrated or external mains switches, for manual or automated operation on the DC current as well as on the AC current levels.
Moeller offers comprehensive protection for photovoltaic systems

Minute currents from photovoltaic or solar cells can be combined in photovoltaic systems to ever larger currents. All current magnitudes need to be isolated, protected and switched. The switchgear needs to be enclosed both in sections and in large switchboards. Moeller offers a comprehensive range of switchgear, enclosures and switchboards for all these applications, ranging from building services right up to the large photovoltaic systems.

DC string circuit-breaker

In addition to fuses protection of photovoltaic modules is provided by string circuit-breakers. String circuit-breakers protect photovoltaic modules from fault currents. For example, in large systems they prevent regeneration from intact modules to modules with a short-circuit. Their advantage over fuses is that they are immediately ready for use after a trip, and when the cause of the trip has been remedied.

Moeller offers both fuse-switch disconnectors as well as string circuit-breakers. String circuit-breakers are not enclosed and intended for installation in customized generator connection enclosures. They can be combined when necessary with other components such as side-by-side terminals or overvoltage protection devices. The trip currents for the string circuit-breaker can be set over a wide range.

DC switch disconnectors

The VDE 0100-712 (June 2006) standard stipulates the use of a switch-disconnector between the photovoltaic module and the inverter. Moeller provides enclosed and open switch-disconnectors for voltages up to 1000 V DC. They can be used to establish separate switching points as demanded by the VDI standard VDI 6012, so that for example, a defective inverter can be safely disconnected.

All switch-disconnectors switch on two poles and are thus suitable for unearthed systems. And all switches are of course certified by the TÜV.
Safe disconnection and protection of solar panels.

DC switch disconnectors

Moeller offers both enclosed and open switch-disconnectors. Open switch-disconnectors P-SOL are intended for customized enclosures or inverters. They are attached on 35 mm top-hat rails; their terminations facilitate connection of all conventional conductor types. Separate rotary handles and shaft extensions enable flexible installation. An auxiliary contact block for indication of the switch state can be attached. A shunt release module and an undervoltage release module are available for remote tripping.

Compact disconnectors for inverters

Perfectly enclosed for outdoor installation

Connection variants for 2 and 4, or 4 and 8 strings as well as for the most commonly available connector types such as MC3, MC4 or metric cable glands, ensure problem-free integration in different system concepts. The enclosure is implemented to degree of protection IP65 and thus facilitates outdoor installation. Locking capabilities offer protection during service. A pressure equalization element prevents collection of condensation and thus malfunctions due to flash-overs.

DC string circuit-breaker

Disconnector with integrated short-circuit protection

The fuse-switch disconnector C10-FD for cylindrical fuse cartridges Z-C 10/SE .. PV of fuse size 10 x 38, protects photovoltaic modules against short-circuit currents. At the same time measurements can be made on the connected modules at the disconnection point.

String circuit-breaker with remote de-energization

String circuit-breakers PKZ-SOL are the fuseless alternative for the protection of photovoltaic modules against short-circuit. With their variable trip range that can be optimally adjusted to the actual short-circuit current of a string. A thermal release triggers at 1.05 ... 1.3 fold current and the magnetic release at 6-fold current.

Using the optional shunt release A-PKZ0 and undervoltage release U-PKZ0, remote switching, for example, for the fire brigade is possible. The easy to fit auxiliary switch NHI-E-PKZ0 provides switch state information.
High level of flexibility through comprehensive accessory range

Switch-disconnectors N in the special version for up to 1000 V DC can be used on 1- or 2-poles. The comply with the isolation properties even for earthed IT networks. Accessories, such as connection terminals and door coupling rotary handles enable individual installation in the most varied of distribution systems. Auxiliary switches, voltage releases and remote operators facilitate signalling and automation.

Safely master short-circuit currents up to 70 kA

Circuit-breakers NZM with thermo-magnetic overload and short-circuit release are used for the protection of DC systems. They can safely switch off up to 750 V at short-circuit currents of up to 70,000 A. A complete range of accessories is provided just as with the switch-disconnector N.
Moeller switchgear for control, switching and protection of photovoltaic systems.

AC switchgear for systems

Circuit-breakers NZM

Four switches with switching performance overlaps, from the attractively-priced 25 kA for small distribution boards ranging up to 150 kA switching performance for complex high-energy systems, present a comprehensive range for energy distribution applications in the photovoltaic field up to 1600 A. Continuity with the same function, mounting and handling for switches and accessories are features of the new series in a compact design. The comprehensive range of accessories leaves no requirement unfulfilled.

CI insulated enclosure

The weather-proof CI enclosures with enhanced degree of protection IP 65 are ideal for outdoor installation. Several strings are compiled and protected with individual fuses in a generator connection enclosure.

The clever control relay

The proven easy500, easy700 and easy800 control relays come with a full range of technical resources to implement control function applications in photovoltaic systems. Such as the control of solar panels relative to the position of the sun. These control relays are a universal system with common software and operation. A host of different device versions with various functions, voltage types, expansion and networking options are available for implementing the right solution.

Contactors DIL: switching inverters onto the grid

Moeller contactors are the first choice when remote switching of motors and other loads is required. High levels of reliability, proven range of accessories and user-friendly terminations are just a few features of Moeller contactors. Low power consumption DC and AC magnetic drives and double box terminals to safely wire different conductor cross-sections are just two examples of these features. Seven sizes cover the power range up to 2600 A. Moeller also offers 4-pole contactors up to 800 A.
xEnergy energy distribution systems

The new xEnergy switchgear system is designed to ensure that your photovoltaic-related projects are efficiently designed from the planning phase right up to the construction and assembly phases. Ideal prerequisites for building services infrastructure up to 4000 A. Type-tested components combine to a technical and economical unit consisting of switchgear, mounting systems, enclosures as well as the tools/service. The new system is designed as a modular system and can be intelligently combined. Not only do you save time, but money and space as well. You also put your trust in certified safety from Moeller.

Xpole circuit-breakers

Xpole circuit-breakers offer your customers maximum protection. The products of the Xpole series combine all the function, mounting and safety benefits. They can be quickly and easily installed. Intelligent construction design solutions which exclude any mounting errors guarantee high levels of safety during installation. The devices guarantee the end users not only protection for personnel (residual-current circuit-breaker) but also protection of the electrical system (overvoltage protection switch, miniature circuit-breaker). The product range is rounded off by a comprehensive range of intelligent switchgear such as remote switches, reset devices, etc.
Miniature circuit-breakers

Whether its plug-in terminals or screw connections, Moeller has the right circuit-breakers for domestic as well as for industrial applications. A comprehensive range of accessories such as auxiliary switches, shunt releases, reset devices and clever busbar solutions facilitate a host of applications and automation solutions.

Residual current circuit-breakers

The comprehensive Moeller residual current circuit-breaker series enables - depending on the application – optimum fault current protection or even personnel protection in an electrical system. Surge current protected designs prevent unwanted shutdown and selective types facilitate discriminative shutdown of the defective system section.

Distribution boards

From service distribution boards, to the meter cabinet, to the energy distribution and the data network cabinet, Moeller offers a fully comprehensive product range. Thus all of your applications can be covered for the infrastructure in domestic, purpose-built and industrial energy distribution applications.

Comfort, safety and energy management – wireless house automation from Moeller

Automation tasks such as illumination management, shading control, monitoring and warning of dangers as well as energy efficient control concepts for heating, ventilation and air-conditioning are easy with Moeller products, and simple to implement.
Surge protection devices

Dangers to electrical systems by lightning and overvoltage’s are made safe by Moeller surge protection devices. The comprehensive product range offers protection to the end user. Easily fitted auxiliary switches facilitate monitoring of the functionality of the surge protection device.
## Technical data

### DC switch disconnectors

<table>
<thead>
<tr>
<th>Construction design</th>
<th>open</th>
<th>enclosed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated operational current (I&lt;sub&gt;n&lt;/sub&gt; at DC21A (A))</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Rated operational voltage (U&lt;sub&gt;e&lt;/sub&gt; (VDC))</td>
<td>1000 in enclosures with protection class II</td>
<td>1000</td>
</tr>
<tr>
<td>Number of poles</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Type designation</td>
<td>P-SOL20 P-SOL30 P-SOL60 SOL20/2MC3 SOL20/4MC3 SOL20/2MC4 SOL20/4MC4 SOL20/2MV SOL20/4MC3 SOL30/2MC3 SOL30/4MC3 SOL30/2MC4 SOL30/4MC4 SOL30/2MV SOL30/4MC4</td>
<td></td>
</tr>
<tr>
<td>Part no.</td>
<td>120934 120935 120936 120913 120914 120915 120916 120919 120920 120921 120922</td>
<td></td>
</tr>
</tbody>
</table>

### DC inputs

- **Number of strings**: 2 4 2 4 2 4 2 4 2 4
- **Connection type**: MC3 MC3 MC4 MC4 M12 MC3 MC3 MC4 MC4 M12

### DC outputs

- **Number of poles**: 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
- **Connection type**: MC3 MC3 MC4 MC4 M12 MC3 MC3 MC4 MC4 M12 M16 MC3 MC3 MC4 MC4

### Dimensions

- **Width (mm)**: 58.2 55 100
- **Height (mm)**: 92.4 140 214
- **Depth (mm)**: 75.3 160 130.5

### DC (string) circuit-breaker

<table>
<thead>
<tr>
<th>Construction design</th>
<th>open</th>
<th>-</th>
<th>open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current (I&lt;sub&gt;n&lt;/sub&gt; (A))</td>
<td>20</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Rated operational voltage (U&lt;sub&gt;e&lt;/sub&gt; (VDC))</td>
<td>900 in enclosures with protection class II</td>
<td>900 with fuse-switch disconnector CD-FD</td>
<td>900 in enclosure</td>
</tr>
<tr>
<td>Number of poles</td>
<td>1 2 1 2 1 1 1 1 1 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part no.</td>
<td>119024 119025 119026 119027 119028 112009 112070 112071 112072 112073 120937</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuse size</td>
<td>10 x 38 to IEC 60269, UL284-4 10 x 38 to IEC 60269, UL284-4 -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overload release</td>
<td>- - - - 1.05 ... 1.3 x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit current trip</td>
<td>- - - - 8 x I&lt;sub&gt;n&lt;/sub&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dimensions

- **Width (mm)**: 17.5 35.6 17.5 35.6 10.3 10.3 10.3 10.3 58.2
- **Height (mm)**: 83.3 83.3 83.3 83.3 38 38 38 38 92.4
- **Depth (mm)**: 64 64 64 64 10.3 10.3 10.3 10.3 75.3
### DC Switch Disconnectors

#### Construction Design
- Open
- Enclosed

#### Rated Operational Current (Ie)
- 20, 30, 63, 160, 200, 320, 450, 800, 1000, 1250, 1400 A

#### Rated Operational Voltage (Ue)
- 1000 VDC

#### Number of Poles
- 2, 4

#### Type Designation
- SOL20/2MC3
- SOL20/4MC3
- SOL20/2MC4
- SOL20/4MC4
- SOL30/2MC3
- SOL30/4MC3
- SOL30/2MC4
- SOL30/4MC4
- SOL60/4MC3
- SOL60/8MC3
- SOL60/4MC4
- SOL60/8MC4
- N2-4-160-S1-DC
- N2-4-200-S1-DC
- N3-4-320-S1-DC
- N3-4-450-S1-DC
- N4-4-800-S1-DC
- N4-4-1250-S1-DC
- N4-4-1400-S1-DC

#### Part Numbers
- 120923, 120924, 120925, 120926, 120927, 120928, 120929, 120930, 120931, 120932, 120933, 120934, 120935, 120936, 120937, 120938, 120939, 120940, 120941, 120942

#### Dimensions
- Width (mm): 58.2, 55, 90, 105, 140
- Height (mm): 92.4, 140, 184, 275
- Depth (mm): 75.3, 160, 84.5

#### DC Inputs
- Number of Strings: 2, 4
- Connection Type: MC3, MC4

#### DC Outputs
- Poles: 1, 2
- Connection Type: MC3, MC4, M12, M16

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### DC (String) Circuit Breaker

#### Construction Design
- Open

#### Rated Current (In)
- 20, 63, 125, 200, 320, 400, 500 A

#### Rated Operational Voltage (Ue)
- 900 VDC
- 500, 750 VDC

#### Number of Poles
- 1, 2

#### Type Designation
- C10-FD/20/1
- C10-FD/20/2
- C10-FD/20/1-L
- C10-FD/20/2-L
- Z-C10/SE-6A/PV
- Z-C10/SE-8A/PV
- Z-C10/SE-10A/PV
- Z-C10/SE-16A/PV
- PKZ-SOL12
- PKZ-SOL20
- PKZ-SOL30
- PKZ-SOL40
- PKZ-SOL50
- PKZ-SOL60
- NZMN1-A80
- NZMN1-A100
- NZMN1-A125
- NZMN2-A180
- NZMN2-A200
- NZMN2-A250
- NZMN3-A320
- NZMN3-A400
- NZMN3-A500

#### Part Numbers
- 119024, 119025, 119026, 119027, 122009, 122070, 122071, 122072, 122073, 120937, 120938, 120939, 120940, 120941, 120942

#### Fuse Size
- 10 x 38 mm to IEC 60269, UL284-4

#### Overload Release
- I-t characteristic for photovoltaic application
  - 1.05 ... 1.3 x In

#### Short-Circuit Current Trip
- 6 ... 10 x In

#### Dimensions
- Width (mm): 17.5, 35.6
- Height (mm): 83.3
- Depth (mm): 64

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### Additional Information

- Overload release characteristics
- Short-circuit current trip characteristics
- Dimensions for various configurations

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**Note:** The table provides a summary of specifications and part numbers for DC switch disconnectors and DC (string) circuit breakers. Further details and specifications may be required for specific applications.
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