# Solutions for photovoltaic systems

From mounting systems and cable management, to lightning and surge protection all the way to fire protection



OBO BETTERMANN

# Taking responsibility, securing the system

The erection of a photovoltaic system often requires major intervention in the electrical infrastructure of a building. This is reflected in the wide range of standards and regulations to be complied with. The person erecting the system is liable for correct fulfilment for 30 years, and the requirements of the insurance company come on top of that.

The specialist company installing a PV system is required by law to hand it over in perfect condition.

## Responsibility of the operator

Through the feed-in of the gained energy, almost every PV system is subject to the requirements for commercial use. For the system operator, this creates the obligation to give the system the proper maintenance, checking and repairs. These regular recurring checks of the electrical system components may only be carried out by an electrical technician.

*"The overall responsibility for electrical safety is in the hands of the commissioner."*

**Photovoltaics working party**

*"People, animals and property must be protected against damage from surge voltages, the consequences of atmospheric impacts or switching surges."*

**VDE 0100-100 (IEC 60364-1)**

# Relevant standards

**Low-voltage electrical installations**
- DIN VDE 0100-100 (IEC 60364-1)
- DIN VDE 0100-534 (IEC 60364-5-53)
- DIN VDE 0100-410 (IEC 60364-4-41)
- DIN VDE 0100-443 (IEC 60364-4-44)
- DIN EN 60664-1 (IEC 60664-1)

**Tests (commissioning test) and documentation**
- VDE 0100-600 (IEC 60364-6)
- VDE 0105-100 (EN 50110-1)

**Requirements for PV power supply systems**
- DIN VDE 0100-712 (IEC 60364-7-712)
- DIN EN 62446 (IEC 62446)
- DIN CLC/TS 61643-12 (IEC 61643-12)
- DIN CLC/TS 50539-12 (CLC/TS 51643-32, IEC 61643-32)
- VDE 0185-305-3 Supplement 5

**Lightning protection systems and earthing systems**
- DIN EN 62305-1 to -4 (IEC 62305-1 to -4)
- Local additional requirements (e.g. state building regulations in Germany)
- DIN 18014
- DIN VDE 0100-540 (IEC 60364-5-54)

**Fire protection in the PV area**
- VDE-AR-E 2510-2

**Construction regulations**
- EN 13501-1/-2, DIN 4102-1/-2 Fire classification of construction products and building elements
- The national and regional construction regulations must be observed with regard to the use of construction products. These include, for example, the state construction regulations in Germany, VKF regulations in Switzerland and OIB directives in Austria.

**VdS guidelines for fire protection and safety of electrical and photovoltaic systems**
- VdS 2025 – Electrical cabling systems
- VdS 3145 – Photovoltaic systems
- VdS 6023 – Photovoltaic systems on roofs with flammable building materials

*This list makes no claim to completeness! Please observe the appropriate local and statutory requirements.*

# Install the future!

With OBO, you are on the (b)right side from the start: This is because we not only offer you a complete system for almost every electrical requirement of a photovoltaic system, but also future-oriented solutions for flexible installations. Leading the way are our innovative mounting systems for pitched roofs, flat roofs and free-standing systems: the Magic PV solution. For more efficiency – solar, so good!

## The benefits of the Magic PV solution

- Less work: A slim overall portfolio offers a simplified product selection and reduces warehouse storage to a minimum.
- More flexibility: With the Magic PV Solution, countless customer-specific solutions and structural implementation options can be implemented.
- More security: Correct installation of all standard PV module dimensions is very simple.
- Versatile: The OBO systems can be adapted to different installation conditions with ease.
- More future: Digital planning tools and an innovative product configurator provide support in advising your customers.

# Planning the Magic PV Solution with OBO Construct

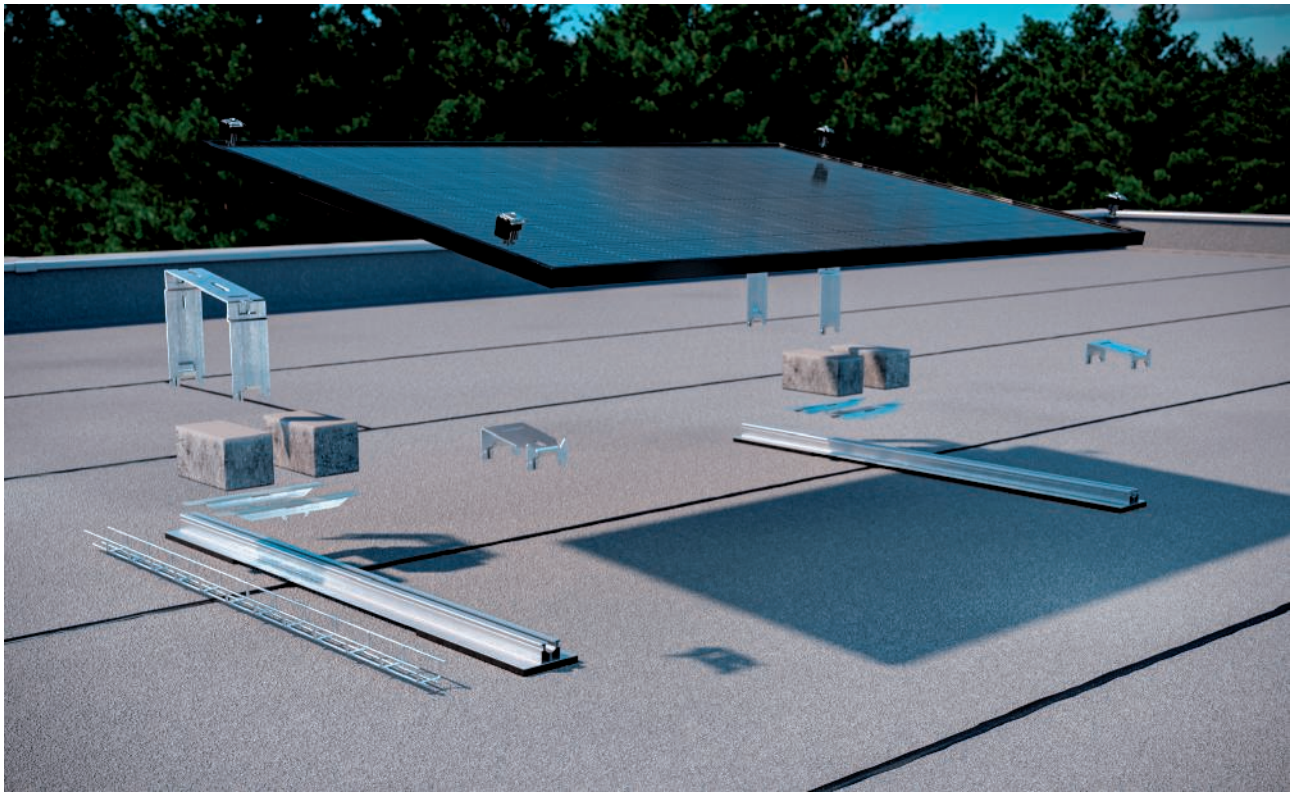
PV mounting systems have never been easier to plan: The OBO Construct Tool for the Magic PV Solution makes planning mounting systems for flat and pitched roofs intuitive, organised and fast. Step by step, a custom system solution emerges, tailored exactly to your requirements.

The tool automatically identifies all required components, creates suitable planning drawings and provides relevant documents, such as tender texts and documents for static calculation, for download.

## Advantages at a glance

- Explained step by step
- Intuitive to use
- The right PV mounting system in just a few clicks
- Order list created automatically based on configured quantities
- Download option for static calculation documentation
- Seamless user experience thanks to Elbridge. The configured products can easily be transferred to online wholesaler shops

# Magic PV Flat Basic
# Flat-roof systems



Photovoltaic systems positioned on flat roofs can have a decisive advantage, as the PV modules can be mounted independently of a given roof orientation. Our long-lasting, highly resilient Magic PV Flat Basic system provides even more benefits with a streamlined product range that offers the highest levels of flexibility. For even better overall system performance, the Magic PV Flat Basic can be extended with multiple components featuring optimised aerodynamics. With new short and long supports – for both south or east-west orientation –, a ballast support plate and a wind protection panel.

## Advantages at a glance

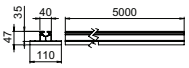
- Integrated system for cable routing and simultaneous ballasting
- Stepless system design thanks to flexible ridge gap
- Lean product portfolio with the greatest-possible flexibility
- Enables various system structures in flexible east-west and south versions
- Flatter structure height (~10°) – reduces wind load and shading
- Lower required ballast volume – reduces the load on the roof structure and enables applications on lighter roof structures
- Cost-effective logistics – thanks to some components that are folded

Alu BK

## Support profile for PV module mounting, flat roof

| Type | Length mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **TPF 35 5000 ALU** | 5000 | 4 | | 716.300 | **5900370** |

Non-slip support profile for PV module mounting on flat roofs.
Basis for installation of short and long supports STK and STL. Screwable connection of multiple support profiles with LV 35 straight connectors.



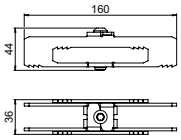

St DD

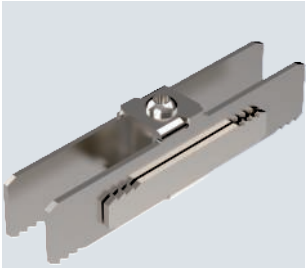
CE

## Straight connector support profile, flat roof

| Type | Min. ordering quantity Piece | | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **LV 35 DD** | 20 | | | 36.800 | **5901180** |

Straight connector for connecting support profiles type TPF 35 for photovoltaic flat roof systems. Fastening with pre-installed M6 screw, screwable with Torx 30 key.



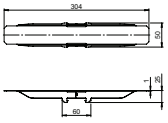
St DD

CE

## Ballast plate for PV mounting systems, flat roofs

| Type | Min. ordering quantity Piece | | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **BTP 35 DD** | 20 | | | 13.000 | **5901674** |

Metal ballast plate to take, for example, paving stones for ballasting PV mounting systems for flat roofs. Toolless installation by clamping onto truss profile rails of types TPF 35 and TP 45.



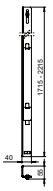

St DD

CE

## Ballast rail for flat-roof PV mounting systems

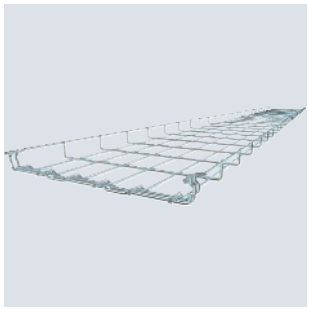
| Type | Min. ordering quantity Piece | | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **BS DD** | 4 | | | 311.000 | **5901686** |

Ballast rail to ballast PV mounting systems on flat roofs, suitable to accept blocks or concrete slabs, for example. Screw fastening on support profile TPF 35, flexible length adaptation to support profile distances.




## Mesh cable tray GR-Magic® 35

St FT



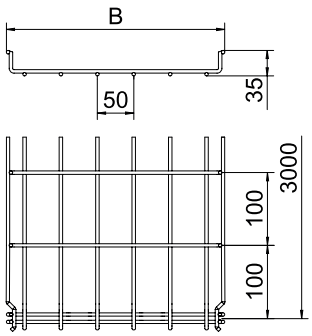
| Type | Width mm | Wire Ø mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **GRM 35 50 FT** | 50 | 3.9 | 3 | **6000069** |

No additional connection components are required for the mesh cable tray, it is simply interlocked. The grid width is 50 x 100 mm (exception: GRM 35/50 = 20 x 100 mm).

Mesh cable tray with shaped connector of side height 35 mm.

Magnetic shield insulation without cover 15 dB, with cover 25 dB.

### Dimensions

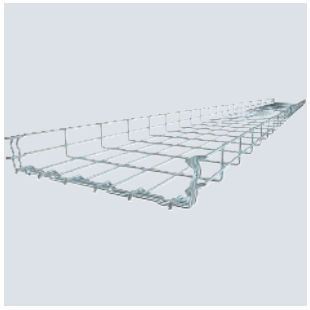



| Type | Length mm | Dim. B mm | Usable cross-section cm² |
|---|---|---|---|
| GRM 35 50 FT | 3000 | 52 | 9.4 |

## GR-Magic® 55 mesh cable tray

St FT

CE E30 E60 E90



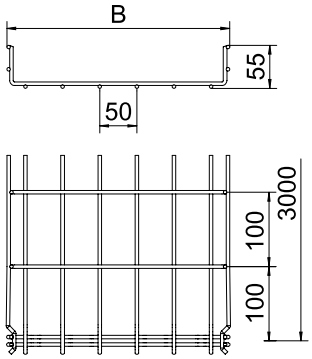
| Type | Width mm | Wire Ø mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **GRM 55 100 FT** | 100 | 3.9 | 3 | **6001416** |
| **GRM 55 200 FT** | 200 | 3.9 | 3 | **6001420** |
| **GRM 55 300 FT** | 300 | 4.8 | 3 | **6001424** |
| **GRM 55 400 FT** | 400 | 4.8 | 3 | **6001428** |
| **GRM 55 500 FT** | 500 | 4.8 | 3 | **6001432** |
| **GRM 55 600 FT** | 600 | 4.8 | 3 | **6001436** |

Mesh cable tray with shaped connector of side height 55 mm.

Magnetic shield insulation without cover 15 dB, with cover 25 dB.
You can find detailed information regarding the UL classification in the respective certification.

No additional connection components are required for the mesh cable tray, it is simply interlocked. The grid width is 50 x 100 mm (exception: GRM 55/50 = 20 x 100 mm).

### Dimensions



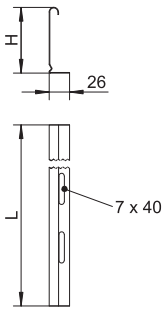

| Type | Length mm | Dim. B mm | Usable cross-section cm² |
|---|---|---|---|
| GRM 55 100 FT | 3000 | 100 | 40 |
| GRM 55 200 FT | 3000 | 200 | 87 |
| GRM 55 300 FT | 3000 | 300 | 129 |
| GRM 55 400 FT | 3000 | 400 | 175 |
| GRM 55 500 FT | 3000 | 500 | 220 |
| GRM 55 600 FT | 3000 | 600 | 265 |

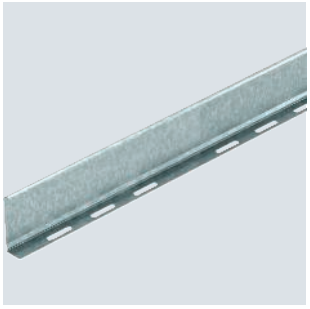
St DD

## Barrier strip 45

| Type | Dim. H mm | Metal thickness mm | Dim. L mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| TSG 45 DD | 45 | 0.75 | 3000 | 3 | 6062321 |

Barrier strip for separation of cables of different voltages or functions.



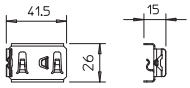



A2 2B

## Clamping piece for separating retainer fastening in GRM

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| KS GR A2 | 30 | 0.830 | 6062282 |

Clamping piece for fastening separating retainer in mesh cable trays.

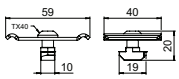


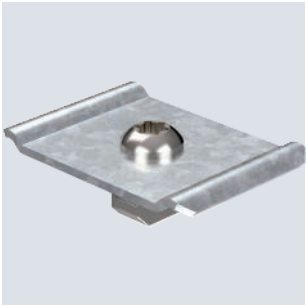

St FT

## Fastening set mesh cable tray, PV mounting system, flat roof

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| BF GR | 20 | 5.000 | 5901770 |

Fastening set for fastening mesh cable trays to support profiles type TPF 35 for PV mounting systems for flat roofs. Consisting of clamping piece, sliding nut and screw.



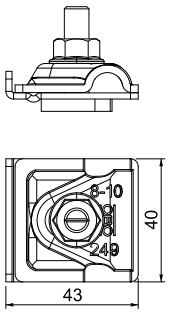



A2

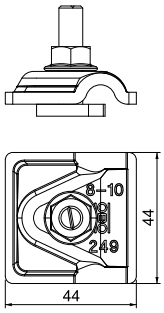
## Earthing terminal for PV mounting systems

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| 249 PV10 6-50V2A | 40 | 43 | 34 | 8 | 8.460 | 5051520 |

Pre-mounted earthing terminal for the inclusion of PV mounting systems in the equipotential bonding. Suitable for the inclusion of the PV mounting systems in an external lightning protection system.
- Lightning current-compatible up to 100 kA (10/350)
- Rapid mounting through integrated spring mechanism
- For round conductor fastening RD 8–10
- To fasten single/multi-wire cables: 6–50 mm²
- For profiles with 10 mm groove
- Meets the requirements of DIN EN 62561-1




## Earthing terminal for PV mounting systems



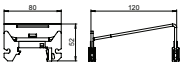

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **249 PV8-10 ALU** | 44 | 44 | 34 | 10 | | 4.500 | **5051526** |

Earthing terminal for the inclusion of PV mounting systems in the equipotential bonding.

- For round conductor fastening RD 8–10
- For profiles with 10 mm groove

## Short support for PV module mounting, 10°, flat roof

St DD

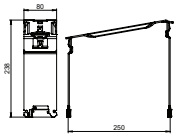



| Type | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|
| **STK AD DD** | 8 | | **5901660** |

Short support for PV module mounting on flat roofs. Mounting in combination with support profile TPF 35 and universal clamp KLU or end and connection clamps with springs (KLE F/KLZ F). Angle of inclination 10°. Lockable fastening on support profile.

## Long support for PV module mounting in east-west orientation, flat roof

St DD

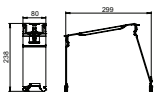



| Type | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|
| **STLOW AD DD** | 8 | | **5901667** |

Long support for PV module mounting on flat roofs in east-west orientation. Mounting in combination with support profile TPF 35 and universal clamp KLU or end and connection clamps with springs (KLE F/KLZ F). Angle of inclination 10°. Lockable fastening on support profile.

## Long support for PV module mounting, south orientation, flat roof

St DD




| Type | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|
| **STLS AD DD** | 8 | | **5901665** |

Long support for PV module mounting on flat roofs in south orientation. Mounting in combination with support profile TPF 35 and universal clamp KLU or end and connection clamps with springs (KLE F/KLZ F). Angle of inclination 10°. Lockable fastening on support profile.

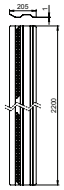
St DD

CE

## Wind protection panel for photovoltaic systems

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| WSB 2200 AD DD | 4 | 382.000 | 5901618 |

Wind protection panel for use with photovoltaic systems with south alignment and standard inclinations of 10°. As protection against wind loads during extreme wind conditions. Lockable and screwable fastening to STLS AD long support.



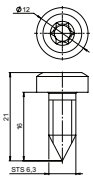

A2

CE

## Flat-head screw for wind protection plate WSB 2200 AD

| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| STS 6,3x16C A2 | 100 | 5901875 |

Self-tapping flat-head screw with hexalobular internal to fasten wind protection plates type WSB 2200 AD to the STLS AD DD long supports of the photovoltaic mounting systems for flat roofs. Matching Torx 30 key.



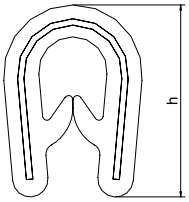

PVC

CE UK CA UV RESISTANT

## Edge protection strip

| Type | For metal thickness mm | Dim. h mm | Colour | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|---|
| KSB 2 PVC | 0.75-2 | 10 | Black | 10000 | 10 | 6072909 |

Edge protection strip with steel inlay to cover cut plate ends. Black version, UV-resistant.



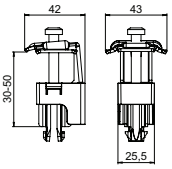

A2 BK

CE

## Universal clamp for PV module mounting

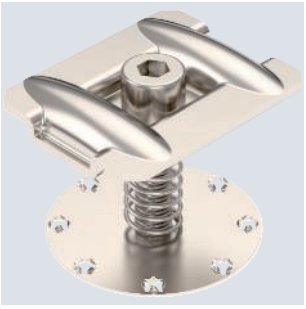
| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| KLU A2 | 30-50 | 20 | 6.590 | 5901010 |

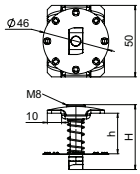
Universal clamp to mount photovoltaic modules on flat and pitched roofs, suitable as a clamp between 2 modules or as an end clamp. Lockable pre-fastening on TP 45 support profile and on STK and STL supports. Suitable for 10 mm slot width. Can be rotated through 90° after engaging. Lockable fastening of the PV module with Torx 30 wrench.




## Intermediate clamp with spring for PV module mounting

A2



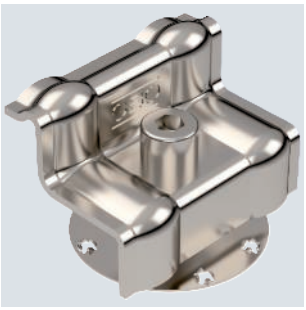


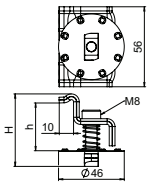

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLZ F 25 A2** | 25 | 50 | 6.150 | **5901062** |
| **KLZ F 30 A2** | 30 | 50 | 6.330 | **5901063** |
| **KLZ F 35 A2** | 35 | 50 | 6.620 | **5901064** |
| **KLZ F 40 A2** | 40 | 50 | 6.720 | **5901065** |

Intermediate clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

## End clamp with spring for PV module mounting

A2



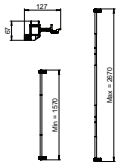



| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLE F 25 A2** | 25 | 50 | 7.850 | **5901092** |
| **KLE F 30 A2** | 30 | 50 | 8.210 | **5901093** |
| **KLE F 35 A2** | 35 | 50 | 8.770 | **5901094** |
| **KLE F 40 A2** | 40 | 50 | 9.620 | **5901095** |

End clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

## Distance gauge for flat roof systems

Alu BK

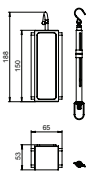



| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **AASL FD** | 1 | **5901620** |

Distance gauge as a mounting aid for PV mounting systems on flat roofs. For more exact positioning of supports on support profiles and to adjust the distances of the support profiles among each other. Flexibly adjustable telescopic rod with 4 terminals.

## Friction coefficient meter

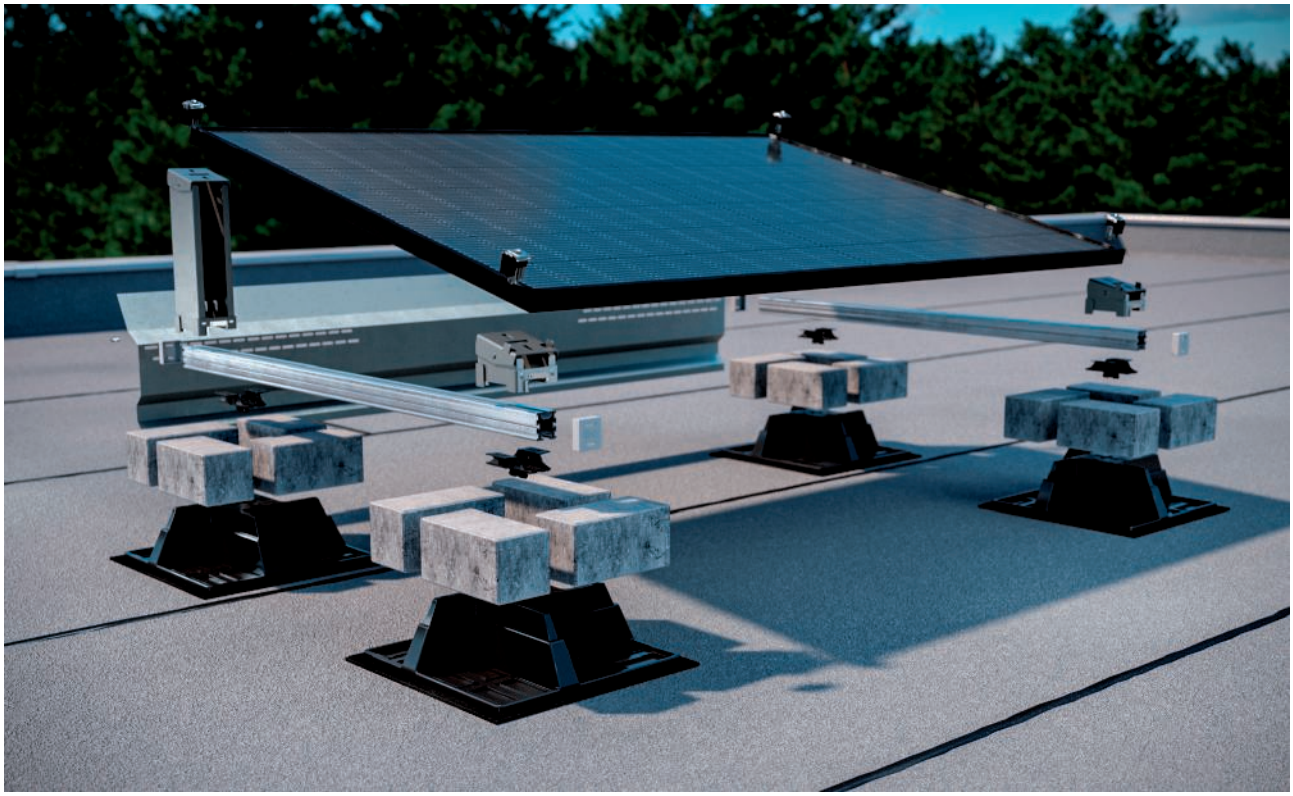
Alu




| Type | Height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **MG RBKOEFF** | 130 | 1 | **5901990** |

Friction coefficient meter for determining the friction coefficient μ on flat roofs with plastic or bitumen waterproofing.

# Magic PV Flat Pro
# Flat-roof systems



Thanks to the Magic technology, the Magic PV Flat Pro system for flat-roof systems is installed without the need for screws or tools. High-quality materials and system components with a high maximum load-bearing capacity form the basis for a long-lasting installation system. A cable routing system with mesh cable trays can also be integrated.

The UniBase ballast system provides variable weighting of the overall system by using rectangular blocks – even possible at any time after the installation. Thanks to the flexible system components, the products for flat-roof and pitched-roof systems can be combined. This reduces the number of individual components required considerably.

## Advantages at a glance

- High-quality material selection and professional cable routing
- Flexible system components
- UniBase ballast system for variable weighting of the entire system
- Also suitable for extensive green roofs

# Magic PV Flat Pro: Harness the full power of your PV system with the right configuration

In addition to the classic orientation with the module surface inclined towards the south, module rows inclined towards each other in east-west orientation are also possible. While the south orientation is ideal for smaller to medium-sized roofs with a sufficient surface when the goal is to maximize the annual yield per installed module, the east-west orientation is typically chosen for large industrial and commercial roofs. Here, the focus is on consistent power generation throughout the entire day.

Our comparison, with details and characteristics, helps you choose the right module alignment for your PV system:

## South orientation

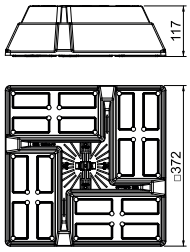
- Maximum specific energy yield per individual PV module
- Ideal for south- or south-east/south-west-oriented roof surfaces
- Only suitable to a limited extent as a system in case of low roof load reserve
- Cable paths usually longer than in east-west systems
- Proven, trusted solution
- Typical angle of inclination in the OBO product range: 10 to 15°

## East-west orientation

- Optimised space utilisation – especially on large roofs
- Consistent generation: grid relief and optimised self-consumption
- Low height, meaning less of the system is visible
- Faster mounting thanks to modular, symmetrical structure
- Good cooling and uniform wind distribution
- Maintenance-friendly with walkable central aisles between the rows

## UniBase universal stand

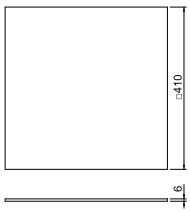
ASA




| Type | Length mm | Width mm | Height mm | Fit mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|---|
| **UniBase 10** | 372 | 372 | 117 | 5 | 8 | | 91.500 | **5403393** |

Universal stand for ballasting with standard blocks up to a dimension of 200 x 100 x 100 mm. Can be used on flat roofs, e.g. for mounting PV mounting systems or for cable routing with cable trays or with mesh cable trays in conjunction with roof cable holder 165 MBG HGRM. Blocks not contained in the scope of delivery.

## Building protection mat, flat roof

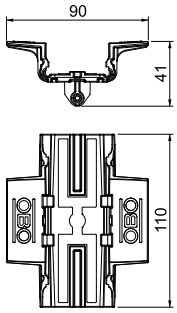



| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **UniBase BSM** | 410 | 410 | 6 | 16 | | 73.950 | **5403402** |
| **UniBase BSM ALU** | 410 | 410 | 6 | 16 | | 75.330 | **5403404** |

Building protection mat as an underlay under stands of type UniBase 6 + UniBase 10 for flat roof PV mounting systems, as protection of the roof seal on flat roofs according to DIN 18531. Also suitable for height compensation of the PV mounting system. Made of recycled material; depending on the version, also available with aluminium lining.

## Adapter for TP 45 support profile

ASA



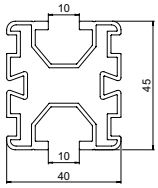

| Type | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **UniBase TMP** | 16 | | 4.200 | **5403397** |

Adapter for TP 45 support profile, for mounting on UniBase universal stand. Toolless mounting through snapping. With side holes for optional screwing and with base perforation for locking screw. Toolless mounting and dismantling of the support profile possible. With non-slip support surface.

## Support profile for PV module mounting

Alu BK

CE




| Type | Length mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **TP 45 2350 ALU** | 2350 | 4 | | 242.520 | **5900405** |
| **TP 45 4700 ALU** | 4700 | 4 | | 485.040 | **5900410** |

Support profile to mount photovoltaic modules on flat and pitched roofs. Flat roof mounting in combination with UniBase universal stand and STK and STL short and long supports. Lockable fastening of the profile on the stand with UniBase AMP adapter. Pitched roof mounting in combination with universal DHU roof hook. Lockable fastening of the profile on roof hooks. Screwable connection of multiple support profiles with LV 45 straight connectors and KV 45 cross-connectors. With 10 mm groove on both sides to accept slide nuts and universal and earthing clamps.

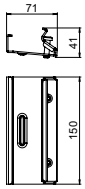
St DD

CE

## Straight connector for TP support profile

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **LV 45 DD** | 20 | 38.600 | **5901210** |

Straight connector for TP support profiles. Can be screwed on with Torx 30 spanner.



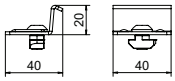

St DD

CE

## Cross-connector for TP support profiles

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **KV 45 DD** | 20 | 5.000 | **5901250** |

Cross-connector for TP support profiles. Can be screwed on with Torx 40 spanner.

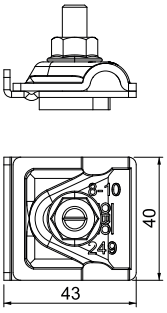



A2

## Earthing terminal for PV mounting systems

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **249 PV10 6-50V2A** | 40 | 43 | 34 | 8 | 8.460 | **5051520** |

Pre-mounted earthing terminal for the inclusion of PV mounting systems in the equipotential bonding. Suitable for the inclusion of the PV mounting systems in an external lightning protection system.
- Lightning current-compatible up to 100 kA (10/350)
- Rapid mounting through integrated spring mechanism
- For round conductor fastening RD 8–10
- To fasten single/multi-wire cables: 6–50 mm²
- For profiles with 10 mm groove
- Meets the requirements of DIN EN 62561-1

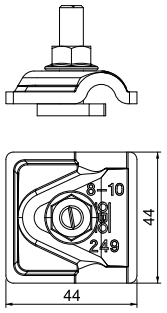



## Earthing terminal for PV mounting systems

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **249 PV8-10 ALU** | 44 | 44 | 34 | 10 | 4.500 | **5051526** |

Earthing terminal for the inclusion of PV mounting systems in the equipotential bonding.

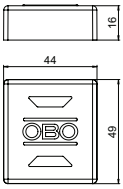
- For round conductor fastening RD 8–10
- For profiles with 10 mm groove




## Support profile end cap

PE

CE



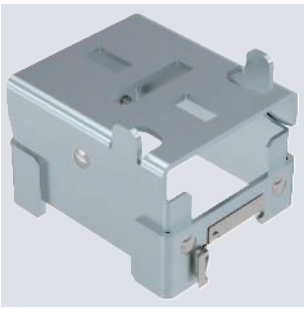

| Type | Colour | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **EK 45 G** | Grey | 20 | 0.740 | **5901722** |

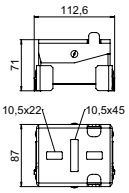
End cap for TP support profiles, as protection against injuries and contamination.

## Short support for PV module mounting, flat roof

St DD

CE





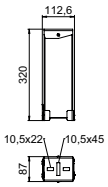

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **STK DD** | 8 | 93.000 | **5901650** |

Short support to mount photovoltaic modules on flat roofs in combination with the TP 45/4700 support profile and KLU universal clamp. Slope angle 15°. Lockable fastening on support profile.

## Long support for PV module mounting, flat roof

St DD

CE



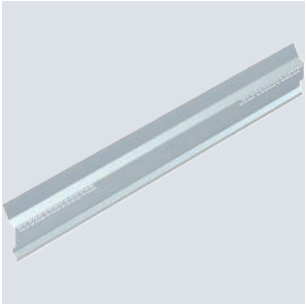

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **STL 15 DD** | 4 | 210.000 | **5901655** |

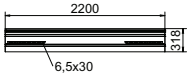
Long support to mount photovoltaic modules on flat roofs in combination with the TP 45/4700 support profile and KLU universal clamp. Slope angle 15°. Lockable fastening on support profile.

## Wind protection panel for photovoltaic systems

St DD

CE






| Type | Length mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **WSB 2200 DD** | 2200 | 4 | 631.000 | **5901610** |

Wind protection panel for use with photovoltaic systems with south alignment and standard inclinations of 15°. As protection against wind loads during extreme wind conditions. Lockable and screwable fastening to STL 15 long support.

A2 2B

CE

## Flat-head screw for wind protection plate

| Type | Dimension mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **FKS M6x25 A2** | M6x25 | 100 | 0.700 | **5901880** |

Flat-head screw with hexalobular internal to fasten wind protection plates to the STL 15 long support of the photovoltaic mounting systems for flat roofs. Matching Torx 30 key.

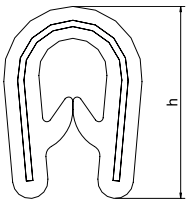
PVC

CE UKCA UV RESISTANT

## Edge protection strip

| Type | For metal thickness mm | Dim. h mm | Colour | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|---|
| **KSB 2 PVC** | 0.75-2 | 10 | Black | 10000 | 10 | **6072909** |

Edge protection strip with steel inlay to cover cut plate ends. Black version, UV-resistant.



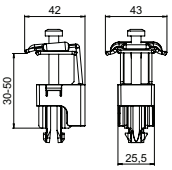

A2 BK

CE

## Universal clamp for PV module mounting

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLU A2** | 30-50 | 20 | 6.590 | **5901010** |

Universal clamp to mount photovoltaic modules on flat and pitched roofs, suitable as a clamp between 2 modules or as an end clamp. Lockable pre-fastening on TP 45 support profile and on STK and STL supports. Suitable for 10 mm slot width. Can be rotated through 90° after engaging. Lockable fastening of the PV module with Torx 30 wrench.



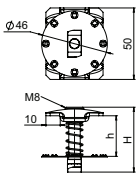

A2

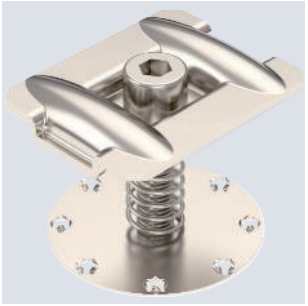
CE

## Intermediate clamp with spring for PV module mounting

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLZ F 25 A2** | 25 | 50 | 6.150 | **5901062** |
| **KLZ F 30 A2** | 30 | 50 | 6.330 | **5901063** |
| **KLZ F 35 A2** | 35 | 50 | 6.620 | **5901064** |
| **KLZ F 40 A2** | 40 | 50 | 6.720 | **5901065** |

Intermediate clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

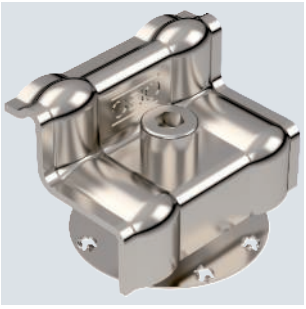


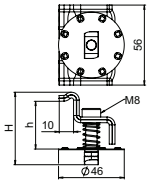



## End clamp with spring for PV module mounting

A2

CE



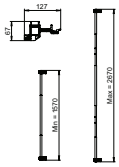



| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLE F 25 A2** | 25 | 50 | 7.850 | **5901092** |
| **KLE F 30 A2** | 30 | 50 | 8.210 | **5901093** |
| **KLE F 35 A2** | 35 | 50 | 8.770 | **5901094** |
| **KLE F 40 A2** | 40 | 50 | 9.620 | **5901095** |

End clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

## Distance gauge for flat roof systems

Alu BK

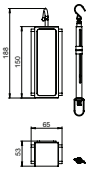



| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **AASL FD** | 1 | **5901620** |

Distance gauge as a mounting aid for PV mounting systems on flat roofs. For more exact positioning of supports on support profiles and to adjust the distances of the support profiles among each other. Flexibly adjustable telescopic rod with 4 terminals.

## Friction coefficient meter

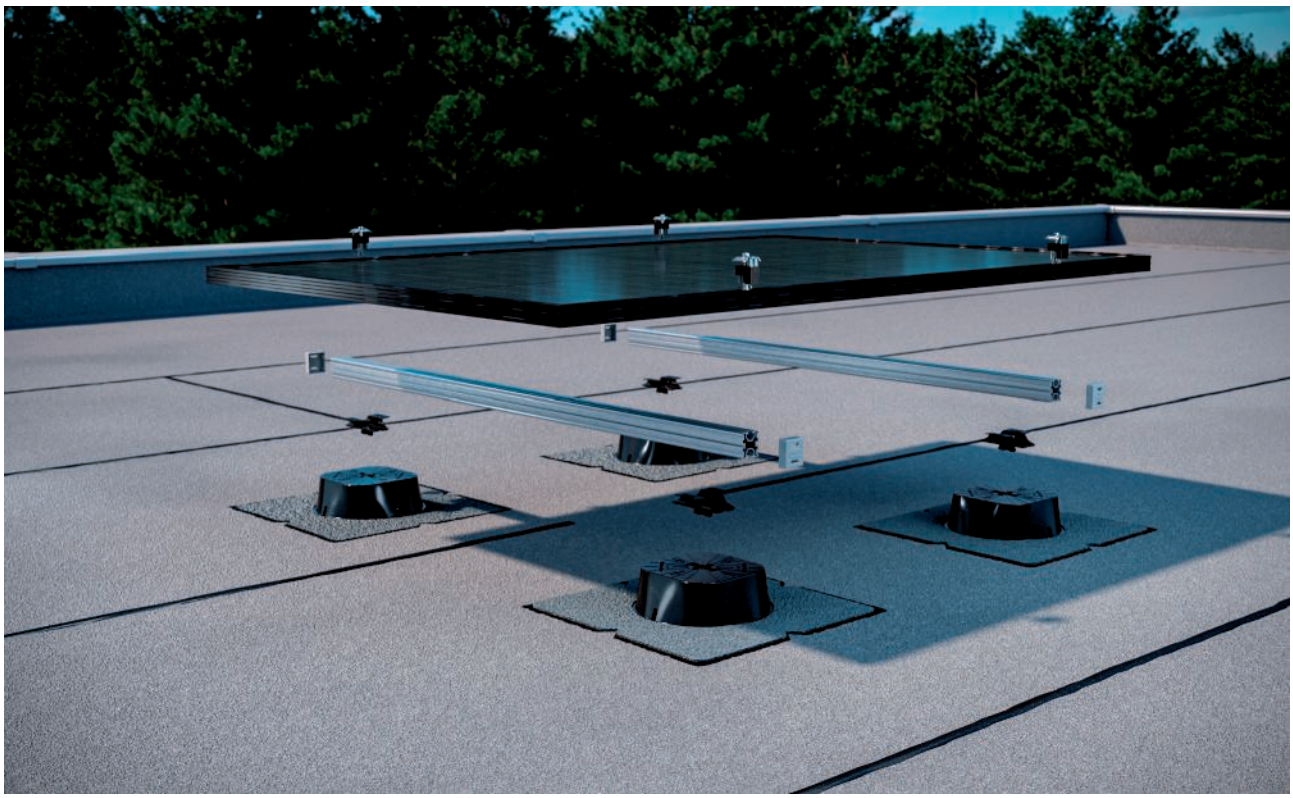
Alu




| Type | Height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **MG RBKOEFF** | 130 | 1 | **5901990** |

Friction coefficient meter for determining the friction coefficient μ on flat roofs with plastic or bitumen waterproofing.

# Magic PV Flat Glue
# Flat-roof systems



The Magic PV Flat Glue universal base can be used as a ballast-free PV mounting system up to a maximum of 5° (corresponding to approx. 8%) on bitumen seals and up to a maximum of 10° (corresponding to approx. 17%) on plastic roof membranes. Its use on pitched roofs with a significant slope is only possible following consultation with OBO and a static analysis. In line with the OBO standard, it is mounted parallel to the roof. A stand-off version is possible as a special solution on request.

## Advantages at a glance

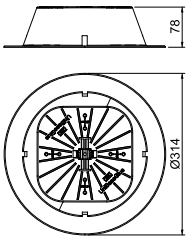
- Uncomplicated installation: The universal base is joined to the existing roof seal with seamless welds via a sleeve available separately
- Systematic: Can be combined with other OBO products, such as the adapter for mounting mesh cable trays, making it ideal for optional cable management within the entire PV system
- High-quality: Plastic type ASA ensures maximum service life outdoors

ASA

## UniBase Glue universal base for bonding

| Type | Height mm | Fit mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **UniBase Glue** | 78 | 5 | 16 | | 39.400 | **5403395** |

Universal stand for gluing on flat roofs. Can be used for routing cables with cable trays or mesh cable trays in conjunction with 165 MBG HGRM roof conductor holders. Gluing collar must be selected according to the substrate.

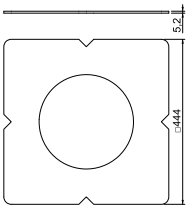


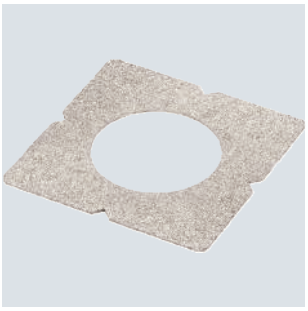

CE

## Fastening sleeve UniBase Glue Bit

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **UniBase Glue Bit** | 444 | 444 | 5.2 | 16 | | 70.000 | **5403410** |

Bitumen fastening sleeve for the adhesive fastening of the universal stand UniBase Glue. Can be used on flat roofs with bitumen waterproofing with a roof pitch of a maximum of 5°.



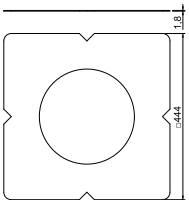



CE

## Fastening sleeve UniBase Glue FPO

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **UniBase Glue FPO** | 444 | 444 | 1.8 | 16 | | 25.000 | **5403412** |

FPO fastening sleeve for the adhesive fastening of the universal stand UniBase Glue. Can be used on flat roofs with FPO waterproofing with a roof pitch of a maximum of 10°.



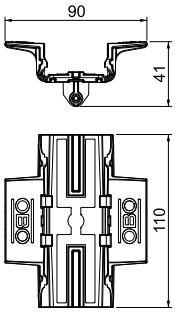



ASA

## Adapter for TP 45 support profile

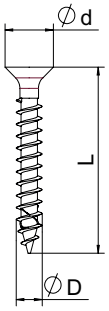
| Type | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **UniBase TMP** | 16 | | 4.200 | **5403397** |

Adapter for TP 45 support profile, for mounting on UniBase universal stand. Toolless mounting through snapping. With side holes for optional screwing and with base perforation for locking screw. Toolless mounting and dismantling of the support profile possible. With non-slip support surface.




## Chipboard screw, with Torx, countersunk head, stainless steel

A4 2B

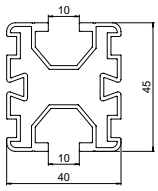



| Type | Dim. L mm | Dim. D mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **OTSC 6,0x40 A4** | 40 | 6 | 100 | **3191082** |

Stainless steel wood screw with countersunk head and Torx drive for fastenings in interior and exterior areas.
Areas of use: Wood, chipboard, plasterboard panels and plastic anchors.

## Support profile for PV module mounting

Alu BK

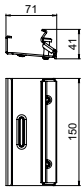



| Type | Length mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **TP 45 2350 ALU** | 2350 | 4 | 242.520 | **5900405** |
| **TP 45 4700 ALU** | 4700 | 4 | 485.040 | **5900410** |

Support profile to mount photovoltaic modules on flat and pitched roofs. Flat roof mounting in combination with UniBase universal stand and STK and STL short and long supports. Lockable fastening of the profile on the stand with UniBase AMP adapter. Pitched roof mounting in combination with universal DHU roof hook. Lockable fastening of the profile on roof hooks. Screwable connection of multiple support profiles with LV 45 straight connectors and KV 45 cross-connectors. With 10 mm groove on both sides to accept slide nuts and universal and earthing clamps.

## Straight connector for TP support profile

St DD




| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **LV 45 DD** | 20 | 38.600 | **5901210** |

Straight connector for TP support profiles. Can be screwed on with Torx 30 spanner.

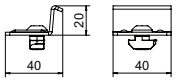
St DD

CE

## Cross-connector for TP support profiles

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **KV 45 DD** | 20 | 5.000 | **5901250** |

Cross-connector for TP support profiles. Can be screwed on with Torx 40 spanner.

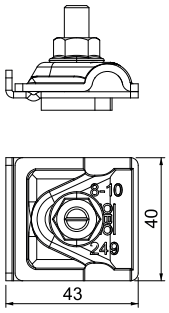



A2

## Earthing terminal for PV mounting systems

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **249 PV10 6-50V2A** | 40 | 43 | 34 | 8 | 8.460 | **5051520** |

Pre-mounted earthing terminal for the inclusion of PV mounting systems in the equipotential bonding. Suitable for the inclusion of the PV mounting systems in an external lightning protection system.
- Lightning current-compatible up to 100 kA (10/350)
- Rapid mounting through integrated spring mechanism
- For round conductor fastening RD 8–10
- To fasten single/multi-wire cables: 6–50 mm²
- For profiles with 10 mm groove
- Meets the requirements of DIN EN 62561-1

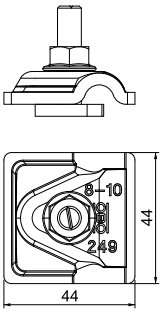



## Earthing terminal for PV mounting systems

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **249 PV8-10 ALU** | 44 | 44 | 34 | 10 | 4.500 | **5051526** |

Earthing terminal for the inclusion of PV mounting systems in the equipotential bonding.

- For round conductor fastening RD 8–10
- For profiles with 10 mm groove



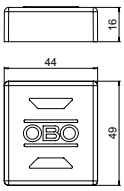

PE

CE

## Support profile end cap

| Type | Colour | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **EK 45 G** | Grey | 20 | 0.740 | **5901722** |

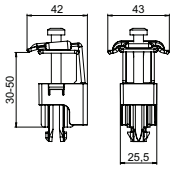
End cap for TP support profiles, as protection against injuries and contamination.




## Universal clamp for PV module mounting

A2 BK

CE



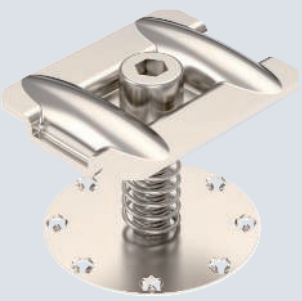

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLU A2** | 30-50 | 20 | 6.590 | **5901010** |

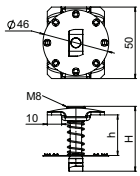
Universal clamp to mount photovoltaic modules on flat and pitched roofs, suitable as a clamp between 2 modules or as an end clamp. Lockable pre-fastening on TP 45 support profile and on STK and STL supports. Suitable for 10 mm slot width. Can be rotated through 90° after engaging. Lockable fastening of the PV module with Torx 30 wrench.

## Intermediate clamp with spring for PV module mounting

A2

CE





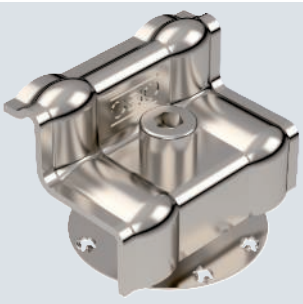

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLZ F 25 A2** | 25 | 50 | 6.150 | **5901062** |
| **KLZ F 30 A2** | 30 | 50 | 6.330 | **5901063** |
| **KLZ F 35 A2** | 35 | 50 | 6.620 | **5901064** |
| **KLZ F 40 A2** | 40 | 50 | 6.720 | **5901065** |

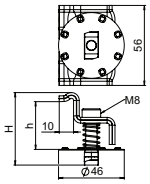
Intermediate clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

## End clamp with spring for PV module mounting

A2

CE

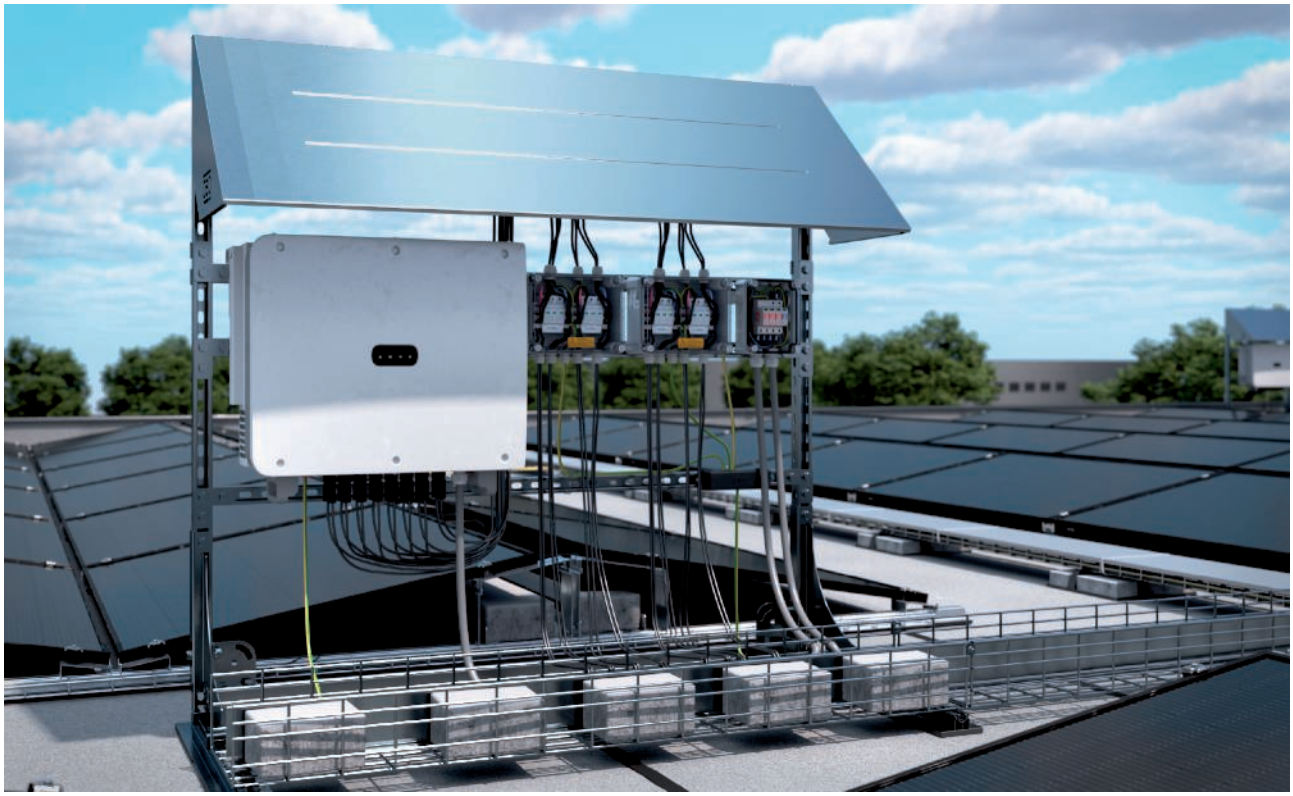





| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLE F 25 A2** | 25 | 50 | 7.850 | **5901092** |
| **KLE F 30 A2** | 30 | 50 | 8.210 | **5901093** |
| **KLE F 35 A2** | 35 | 50 | 8.770 | **5901094** |
| **KLE F 40 A2** | 40 | 50 | 9.620 | **5901095** |

End clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

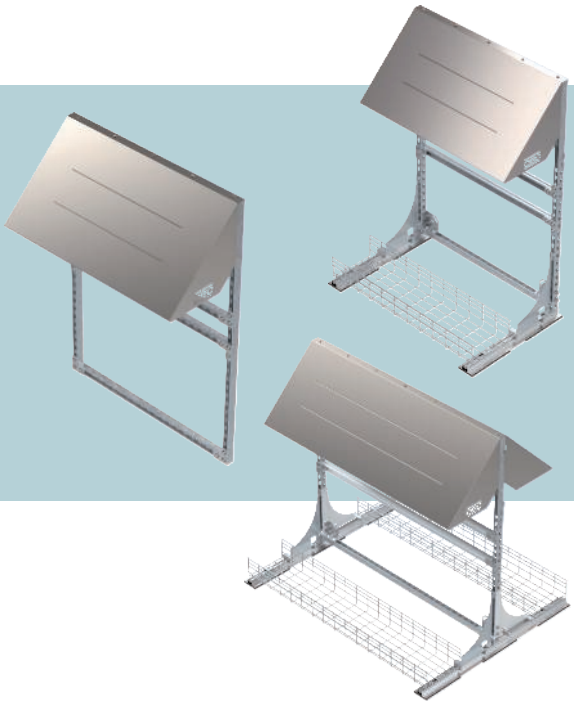
# Magic PV Mount
# Inverter frame



The Magic PV Mount inverter frame system acts a stand for inverters, for instance, but also for many other components such as the DC connection boxes or combiner boxes. The robust protective roof minimises the thermal load, which ensures top performance and maximum service life, while also providing protection against precipitation.

## Advantages at a glance

- Fast mounting thanks to preassembled modules and sophisticated design
- Compatible with PV mounting systems from the OBO portfolio
- Integrated cable management
- Designed for international wind and snow load zones, including documentation according to Eurocode

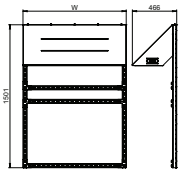


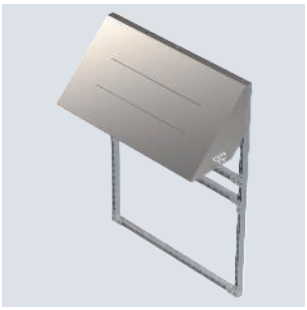
St FT/VA

## Inverter frame for wall mounting.

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **WRR W1000** | 468 | 1082 | 1501 | 1 | **5904005** |
| **WRR W1500** | 468 | 1582 | 1501 | 1 | **5904007** |

Inverter frame for the protected installation of several inverters for PV systems on flat roofs. Mounting on the wall.



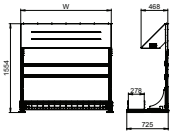



St FT/VA

## Inverter frame, free-standing.

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **WRR F1000** | 725 | 1151 | 800 | 1 | **5904013** |
| **WRR F1500** | 725 | 1651 | 1554 | 1 | **5904015** |

Inverter frame for the protected installation of several inverters for PV systems on flat roofs. Free-standing. Mesh cable tray included for ballasting and for the routing of cables.

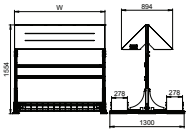



St FT/VA

## Inverter frame, free-standing, double-sided.

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **WRR D1000** | 1300 | 1151 | 1554 | 1 | **5904026** |
| **WRR D1500** | 1300 | 1651 | 1300 | 1 | **5904029** |

Inverter frame for the protected installation of several inverters for PV systems on flat roofs. Free-standing. Loading on both sides possible. 2 mesh cable trays included for ballasting and for the routing of cables.




# Cable management for flat-roof systems

## Wind loads and wind load securing

Wind loads are a climatic force that affects structures and components. These forces can be both horizontal and vertical and have the potential to significantly impact the stability and integrity of buildings and engineering systems. The intensity of wind loads must be assessed separately by the installer for each construction project and depends on many factors. This includes, for example, the location, wind direction, surfaces, roof shape, and size and dimensions of the respective building.

Regions with similar conditions are defined as wind load zones in accordance with EN 1991-1-4. In conjunction with the corresponding national annex, this standard applicable across Europe (also referred to as Eurocode) stipulates basic parameters for determining the effects of natural wind on buildings and engineering structures. The national annexes contain provisions that go beyond the Eurocode rules, i.e. the provisions that were previously part of the national standards.

| Zone | Wind speed in m/s | Speed pressure in kN/m² |
|---|---|---|
| 1 | 1.3 | 0.32 |
| 2 | 25.0 | 0.39 |
| 3 | 27.5 | 0.47 |
| 4 | 30.0 | 0.56 |

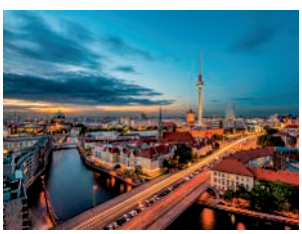
Basic speeds and speed pressures


*Wind zones according to DIN EN 1991-1-4/NA*

**Terrain category 1**
Open sea; lake with at least 5 km of open water in the wind direction and even, flat land without obstacles

**Terrain category 2**
Terrain with hedges, individual farmsteads, buildings or trees, e.g. agricultural areas

**Terrain category 3**
Suburbs, industrial or commercial areas and forests



**Terrain category 4**
Urban areas in which at least 15% of the area is built up with buildings whose average height is higher than 15 m

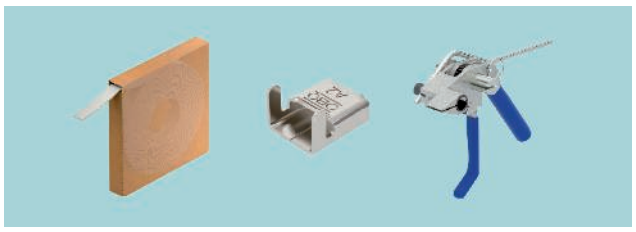
*Terrain categories according to DIN EN 1991-1-4/NA*

**Use of covers outdoors: consider external mechanical forces**
When installing covers outdoors, remember that they are subjected to external mechanical forces. This includes wind, snow and water. These additional loads are not covered by the international standard DIN EN 61537 and therefore have to be assessed separately for each construction project. The installer is responsible for this. Their assessment lays the foundation for additional safety measures that help ensure a permanently stable and safe electrical installation.

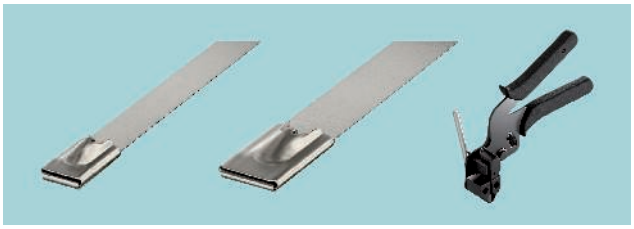
When using covers outdoors in areas that are subject to increased wind, there is a risk of the covers being lifted due to different pressure ratios. Suitable safety precautions have to be taken to prevent possible damage and minimise risks.

OBO offers a variety of solutions for additional support even in strong winds. The selection of a suitable system depends both on the specific construction project and the location. We'll be happy to help.

**Secure fastening even under an increased wind load**
Different metal and tightening straps can be used for the weather-resistant fastening of covers and wind load securing. This ensures especially robust and resistant support, even under high wind loads. OBO offers the following solutions and more:

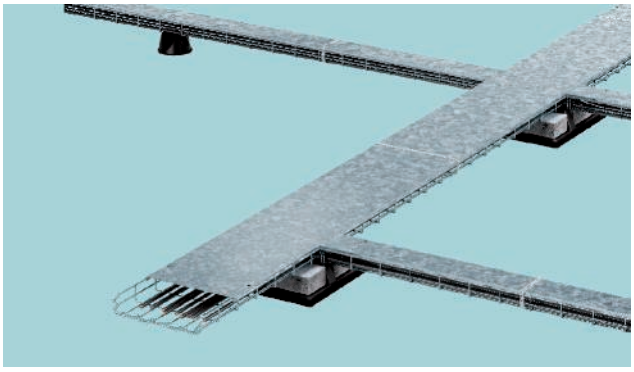


**Tightening straps**
The SBR tightening strap made of galvanised steel, stainless steel or with an additional plastic coating is extremely robust and friction-resistant. It is tested for tensile strength (kN) according to the material (strength) and is available in various colours. Widths of 8 and 15 mm enable flexible adjustment to different cable trays, cable ladders and cable volumes. With the help of the matching SBV tightening strap locks and 576 spring chuck, the tightening straps can be installed simply, quickly and safely.

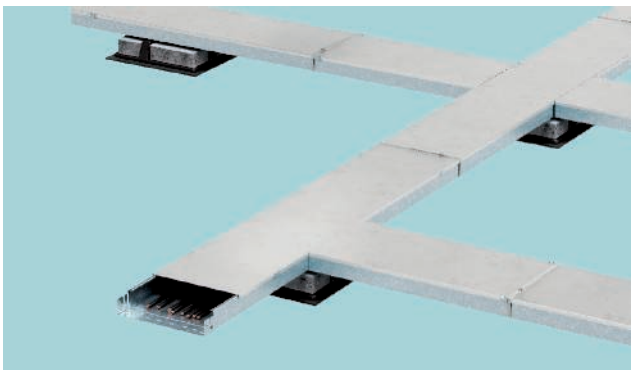


**Metal strip clips**
The MBS strip clips made of metal and with ball lock offer reliable fastening that withstands even high temperatures and adverse weather conditions. With widths of 7, 9 and 12 millimetres as well as different fixed lengths, a wide range of applications is possible. The MBS-Z spring chuck with integrated cutter ensures precise, efficient installation.

**Installation principles, flat-roof mounting**

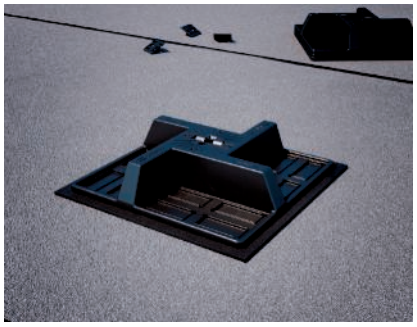


*Flat-roof mounting, GRM mesh cable tray*

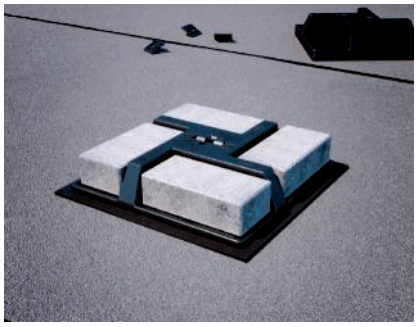


*Flat-roof mounting, MSKMU unperforated cable tray*

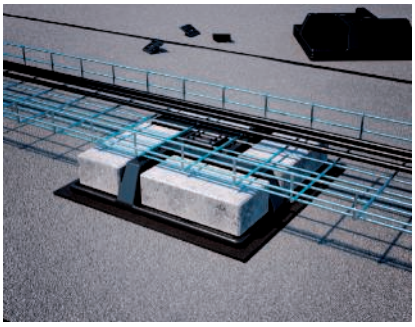
# Mounting aid for flat-roof mounting
# Mesh cable tray GRM



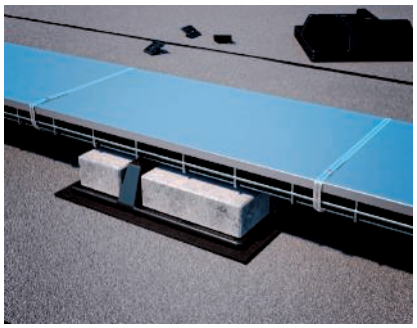
**Placing UniBase 6**
Place the UniBase 6 according to the roof assignment plan and place the UniBase BSM building protection mat under the stands if required. The maximum support spacing between the stands is 1.5 m.



**Ballasting UniBase 6**
The UniBase 6 stand is weighed down using standard blocks of size (length x width x height) 10 x 20 x 6 cm.



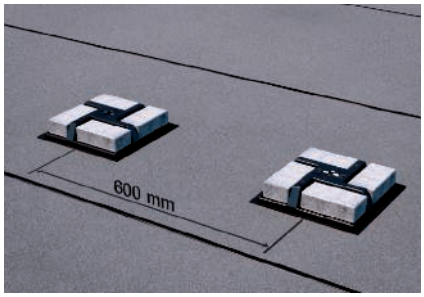
**Placing the GRM mesh cable tray**
The GRM mesh cable tray is fastened to the UniBase 6 universal stand without screws using the type 165 MBG HGRM adapter.



**Mounting and fixing the DGRR cover**
Lock the DGRR mesh cable tray cover on the mesh cable tray and fix it with MBS metal strip clips.

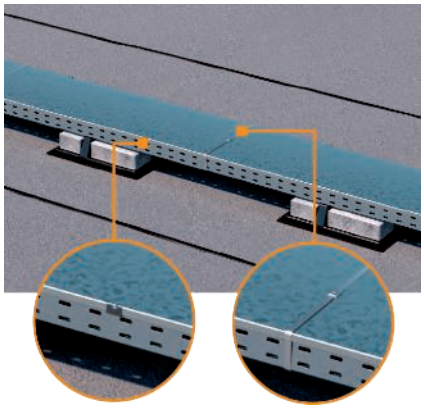
# Example static calculation
# Cable routing on the roof

## Basis of calculation




**1) UniBase spacing**
When installing cable support systems, for example on the UniBase universal stand, make sure that the support surface corresponds to the full width of the installed system. This ensures an even load distribution and increases stability against wind loads. In the following example static calculation, the spacing between the individual UniBase units is 0.6 metres.

**2) Number of cover clamps**
At least 6 cover clamps should be mounted for each 3 metres of cover.



**3) Metal strip clip spacing**
The following is recommended for the spacing between the metal strip clips: Insert three clips per cover at 500, 1,500 and 2,500 mm.

### System components used

| Item no. | Type | Designation |
|---|---|---|
| 5403391 | UniBase 6 | Universal stand, ballasting, blocks up to 6 cm |
| 6047655 | RKSM 630 FT | RKSM Magic cable tray, with quick connector |
| 3191032 | OTSP 6.0x40 A4 | Chipboard screw, panhead, TX 25 |
| 6052656 | DRLU 300 DD | Unperforated cover, for cable trays and cable ladders |
| 6052810 | DK DRLU A2 | Cover clamp, for unperforated covers |
| 7203111 | MBS 100 A2 | Strip clip |

### Formula for proof of stability (sliding + lifting):

$$W_h \times Y_Q \leq (G_{stab} \times Y_{stab} - W_{vh} \times Y_Q) \times \mu$$

### Designations

| | |
|---|---|
| $W_h$ | Characteristic wind load, horizontal |
| $W_{vh}$ | Characteristic wind load, vertical for proof of lifting |
| $G_{stab}$ | Stabilising weight forces |
| $Y_Q$ | Partial safety factor for wind load |
| $Y_{stab}$ | Partial safety factor for stabilising forces |
| $\mu$ | Coefficient of friction |

# Example static calculation
# Cable routing on the roof

**Step 1: Calculate the horizontal wind force on the cable tray**
First, the wind pressure applied horizontally to the side wall of the cable tray is calculated. The pressure is calculated by multiplying the wind gust velocity pressure, the side height, the force coefficient, the safety factor and the block spacing.

$W_{h1}$ x $Y_Q$ = 0.5 kN/m² (wind gust velocity pressure) x 60 mm (side height) x 1.0 (force coefficient) x 1.2 (safety) x 0.6 m (UniBase spacing)) = 21.6 N

**Step 2: Calculate impact on the ballast block**
To calculate the impact of the wind load on the ballast block, the block width/height is multiplied by the wind gust velocity pressure, a force coefficient and the safety factor.

$W_{h2}$ x $\gamma_Q$ = 372 mm (block width) x 80 mm (block height) x 0.5 kN/m2 (wind gust velocity pressure) x 2.1 (force coefficient) x 1.2 (safety) = 37.5 N

**Step 3: Calculate system weight**
The total system weight, including cable tray, cover and ballast block, is calculated taking the gravitational acceleration and safety factor into consideration.

$G_{stab}$ x $\gamma_{stab}$ = (6.12 kg/m (tray + cover) x 0.6 m (block spacing) + 10 kg (block weight)) x 9.81 m/s2 (gravitational acceleration) x 0.9 (safety) = 120.7 N

**Step 4: Determine the lifting load**
To determine the lifting load, first the length exposed to wind is calculated from the block spacing and block width. Multiplying these values results in the area with wind load. Together with the gust velocity pressure, force coefficient and safety factor, this results in the lifting wind load.

$W_{vh}$ x $Y_{Qv}$ = (0.6 m (block spacing) – 372 mm (block width)) x 300 mm (tray width) x 0.5 kN/m2 (wind gust velocity pressure) x 0.5 (vertical force coefficient) x 1.2 (safety) = 20.5 N

**Step 5: Proof of stability**
First, the sum of the horizontal wind forces is determined. The system weight minus the previously determined lifting load with the coefficient of friction results in the maximum possible stabilising force. This determines whether stability is ensured.

$W_{h1}$ x $Y_Q$ + $W_{h2}$ x $Y_Q$ ≤ ($G_{stab}$ x $Y_{stab}$ – $W_{vh}$ x $Y_{Qv}$) x μ
21.6 N + 37.5 N < (120.7 N – 20.5 N) x 0.6 (coefficient of friction μ)
59.1 N < 60.1 N  Proof provided

# Example of national standards for wind and snow loads

### General effects – snow loads

| | |
|---|---|
| **Europe:** | EN 1991-1-3 |
| **Germany:** | DIN EN 1991-1-3 |
| **Belgium:** | NBN EN 1991-1-3 |
| **Austria:** | ÖNORM B 1991-1-3 |
| **The Netherlands:** | NEN-EN 1991-1-3 |
| **Switzerland:** | SIA 261 |
| **Spain:** | CTE DB SE-AE |
| **USA:** | ASCE/SEI 7-16; ASCE/SEI 7-22 |
| **India:** | IS 875-4 |

### General effects – wind loads

| | |
|---|---|
| **Europe:** | EN 1991-1-4 |
| **Germany:** | DIN EN 1991-1-4 |
| **Belgium:** | NBN EN 1991-1-4 |
| **Austria:** | ÖNORM B 1991-1-4 |
| **The Netherlands:** | NEN-EN 1991-1-4 |
| **Switzerland:** | SIA 261 |
| **Spain:** | CTE DB SE-AE |
| **USA:** | ASCE/SEI 7-16; ASCE/SEI 7-22 |
| **India:** | IS 875-3 |

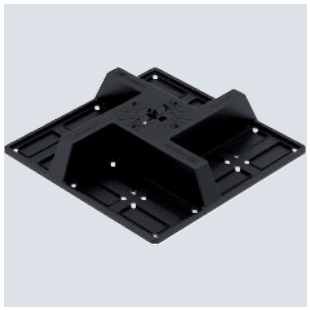
## Service@OBOWe support you in every phase of your project

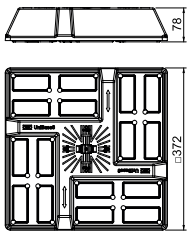
In regions with special climatic challenges in particular, close coordination with specialists and engineers is essential to identify suitable safety measures. This is the only way to ensure a permanently stable electrical installation outdoors.

We are happy to support you throughout every phase of your project. Simply contact our OBO Customer Service, and we will work with you to fulfil your project-specific designs. If necessary, our internal statics expert can be consulted for an additional fee.

## UniBase universal stand

ASA

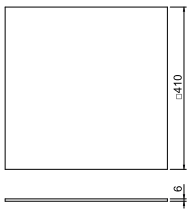





| Type | Length mm | Width mm | Height mm | Fit mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|---|
| **UniBase 6** | 372 | 372 | 78 | 5 | 16 | | 81.000 | **5403391** |

Universal stand for ballasting with standard blocks up to a dimension of 200 x 100 x 100 mm. Can be used on flat roofs, e.g. for mounting PV mounting systems or for cable routing with cable trays or with mesh cable trays in conjunction with roof cable holder 165 MBG HGRM. Blocks not contained in the scope of delivery.

## Building protection mat, flat roof

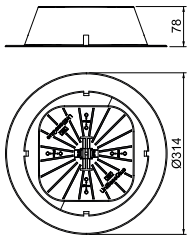



| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **UniBase BSM** | 410 | 410 | 6 | 16 | | 73.950 | **5403402** |
| **UniBase BSM ALU** | 410 | 410 | 6 | 16 | | 75.330 | **5403404** |

Building protection mat as an underlay under stands of type UniBase 6 + UniBase 10 for flat roof PV mounting systems, as protection of the roof seal on flat roofs according to DIN 18531. Also suitable for height compensation of the PV mounting system. Made of recycled material; depending on the version, also available with aluminium lining.

## UniBase Glue universal base for bonding

ASA

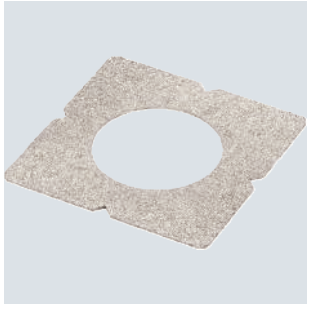


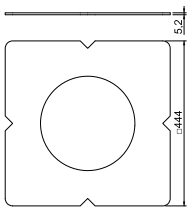

| Type | Height mm | Fit mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **UniBase Glue** | 78 | 5 | 16 | | 39.400 | **5403395** |

Universal stand for gluing on flat roofs. Can be used for routing cables with cable trays or mesh cable trays in conjunction with 165 MBG HGRM roof conductor holders. Gluing collar must be selected according to the substrate.

## Fastening sleeve UniBase Glue Bit

CE






| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **UniBase Glue Bit** | 444 | 444 | 5.2 | 16 | | 70.000 | **5403410** |

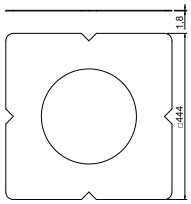
Bitumen fastening sleeve for the adhesive fastening of the universal stand UniBase Glue. Can be used on flat roofs with bitumen waterproofing with a roof pitch of a maximum of 5°.

CE

## Fastening sleeve UniBase Glue FPO

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **UniBase Glue FPO** | 444 | 444 | 1.8 | 16 | | 25.000 | **5403412** |

FPO fastening sleeve for the adhesive fastening of the universal stand UniBase Glue. Can be used on flat roofs with FPO waterproofing with a roof pitch of a maximum of 10°.



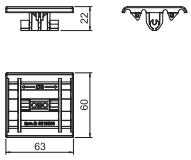



PP

## Mesh cable tray adapter for roof conductor holder

| Type | Material | Fit mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **165 MBG HGRM** | PP | Rd 8 | 50 | | 1.340 | **5218886** |

- Adapter for GR-Magic® mesh cable trays with a mesh width of 50 mm or 20 mm
- For fastening to type 165 MBG 8-10 and UniBase
- Mounting without tools
- From polypropylene, black, UV-resistant and weatherproof
- Toolless installation




St FT

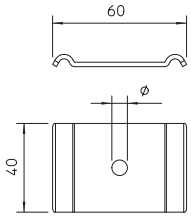
CE

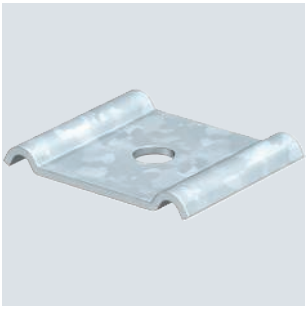
## GKS 50 hold-down clamp

| Type | Hole Ø mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **GKS 50 07 FT** | 7 | 50 | | **6015271** |

Use on mesh cable trays with 50 x 100 mm grid only.

Hold-down clamp for fastening mesh cable trays on the ground or on stand-off brackets of type DBL.



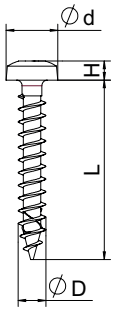
A4 2B

CE

## Chipboard screw, with Torx, panhead, stainless steel

| Type | Dim. L mm | Dim. D mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **OTSP 6,0x40 A4** | 40 | 6 | 100 | | **3191032** |

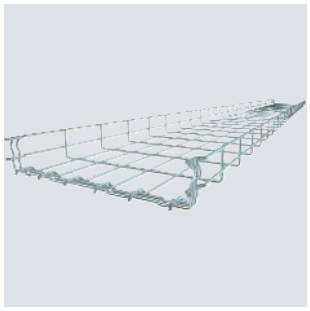
Stainless steel wood screw with lens head and Torx drive for fastenings in interior and exterior areas.
Areas of use: Wood, chipboard, plasterboard panels and plastic anchors.

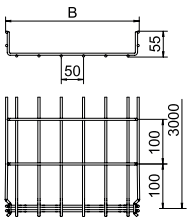



## GR-Magic® 55 mesh cable tray

St FT

CE E30 E60 E90






| Type | Width mm | Wire Ø mm | Length mm | Min. ordering quantity m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|
| **GRM 55 100 FT** | 100 | 3.9 | 3000 | 3 | 74.667 | **6001416** |
| **GRM 55 200 FT** | 200 | 3.9 | 3000 | 3 | 102.000 | **6001420** |
| **GRM 55 200 4.8FT** | 200 | 4.8 | 3000 | 3 | 156.667 | **6001421** |
| **GRM 55 300 FT** | 300 | 4.8 | 3000 | 3 | 200.667 | **6001424** |
| **GRM 55 400 FT** | 400 | 4.8 | 3000 | 3 | 245.000 | **6001428** |
| **GRM 55 500 FT** | 500 | 4.8 | 3000 | 3 | 288.333 | **6001432** |
| **GRM 55 600 FT** | 600 | 4.8 | 3000 | 3 | 331.333 | **6001436** |

Mesh cable tray with shaped connector of side height 55 mm.

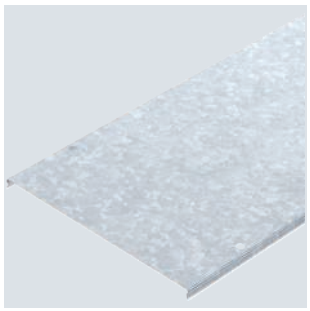
Magnetic shield insulation without cover 15 dB, with cover 25 dB.
You can find detailed information regarding the UL classification in the respective certification.

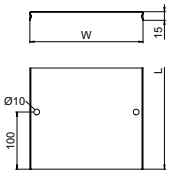
No additional connection components are required for the mesh cable tray, it is simply interlocked. The grid width is 50 x 100 mm (exception: GRM 55/50 = 20 x 100 mm).

## Cover for mesh cable tray, latchable

St FT

CE






| Type | Width mm | Min. ordering quantity m | Weight kg/100 m | Item no. |
|---|---|---|---|---|
| **DGRR 100 FT** | 98 | 3 | 83.000 | **6001822** |
| **DGRR 200 FT** | 198 | 3 | 149.667 | **6001826** |
| **DGRR 300 FT** | 298 | 3 | 216.333 | **6001828** |
| **DGRR 400 FT** | 398 | 3 | 282.667 | **6001830** |
| **DGRR 500 FT** | 498 | 3 | 349.667 | **6001832** |
| **DGRR 600 FT** | 598 | 3 | 418.000 | **6001834** |

With transverse bead from 400 mm width.

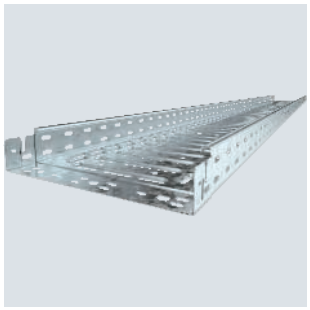
Lockable cover for mesh cable trays of type GR and GRM. Protects cables from damage, contamination and moisture from above. Suitable for industrial areas such as mechanical engineering.

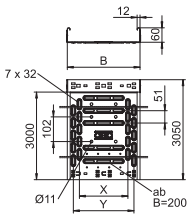
When using covers outdoors, additional measures against the influence of wind may need to be taken.

## Cable tray RKS-Magic® 60

St FT

CE UK CA





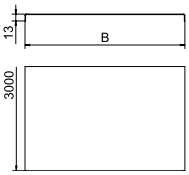

| Type | Width mm | Metal thickness mm | BS | Min. ordering quantity m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|
| **RKSM 610 FT** | 100 | 1.00 | | 3 | 197.410 | **6047612** |
| **RKSM 620 FT** | 200 | 1.00 | | 3 | 251.115 | **6047639** |
| **RKSM 630 FT** | 300 | 1.00 | | 3 | 356.295 | **6047655** |
| **RKSM 640 FT** | 400 | 1.00 | | 3 | 437.180 | **6047690** |
| **RKSM 650 FT** | 500 | 1.00 | | 3 | 518.295 | **6047720** |
| **RKSM 660 FT** | 600 | 1.00 | | 3 | 599.443 | **6047736** |

Cable tray with integrated quick fastening system. The usable length of the cable tray is 3,000 mm.
The cable tray has continuous side perforations of 7 x 20 mm for the installation of additional connection and mounting components.
The perforation for direct threaded rod suspension has a diameter of 11 mm.

St DD

## Unperforated cover

| Type | Dim. B mm | Metal thickness mm | Length mm | Min. ordering quantity m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|
| **DRLU 100 DD** | 100 | 1.00 | 3000 | 3 | 99.000 | **6052643** |
| **DRLU 200 DD** | 200 | 1.00 | 3000 | 3 | 177.500 | **6052650** |
| **DRLU 300 DD** | 300 | 1.00 | 3000 | 3 | 256.000 | **6052656** |
| **DRLU 400 DD** | 400 | 1.00 | 3000 | 3 | 334.500 | **6052662** |
| **DRLU 500 DD** | 500 | 1.50 | 3000 | 3 | 619.234 | **6052668** |
| **DRLU 600 DD** | 600 | 1.50 | 3000 | 3 | 737.000 | **6052674** |




Cover for cable trays and mesh cable trays.

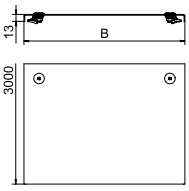
When using covers outdoors, additional measures against the influence of wind must be taken.

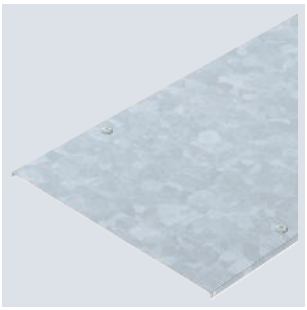
Transverse bead from 500 mm width.

St FT

## Cover with turn buckle

| Type | Dim. B mm | Metal thickness mm | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| **DRL 100 FT** | 100 | 1.00 | 3000 | 3 | **6051340** |
| **DRL 200 FT** | 200 | 1.00 | 3000 | 3 | **6051367** |
| **DRL 300 FT** | 300 | 1.00 | 3000 | 3 | **6051383** |
| **DRL 400 FT** | 400 | 1.50 | 3000 | 3 | **6051413** |
| **DRL 500 FT** | 500 | 1.50 | 3000 | 3 | **6051448** |
| **DRL 600 FT** | 600 | 1.50 | 3000 | 3 | **6051472** |



Transverse bead from 500 mm width.

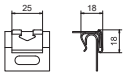
Cover for cable trays and cable ladders with three pairs of turn buckles.

When using covers outdoors, additional measures against the influence of wind must be taken.

A2 2B

## Cover clamp

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **DK DRLU A2** | 30 | 0.842 | **6052810** |



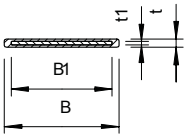

Cover clamp for secure fastening of covers on cable trays and cable ladders.

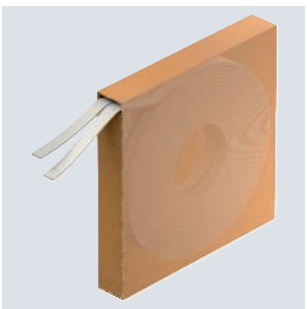
At least 6 cover clamps should be mounted for each 3 metres of cover.

A2 K

## SBR 8 tightening strap

| Type | Avg. breaking load kN | Colour | Dim. B mm | Dim. t mm | Dim. B1 mm | Min. ordering quantity m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|---|---|
| **SBR 8 A2K** | 1.16 | Jet black | 9.3 | 1 | 8 | 40 | 1.704 | **6490192** |



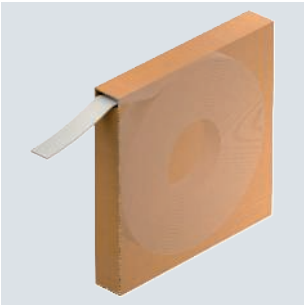



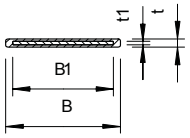
Tightening strap made of rustproof steel with plastic jacketing to fasten cables on cable support systems.

## SBR 15 tightening strap

F1 K

CE





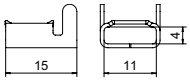

| Type | Avg. breaking load kN | Colour | Min. ordering quantity m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|
| **SBR 15 F1K** | 4.19 | Jet black | 25 | 7.628 | **6490282** |

Tightening strap made of rustproof steel with plastic jacketing to fasten cables on cable support systems.

## SBV 8 tightening strap lock

A2 2B

CE

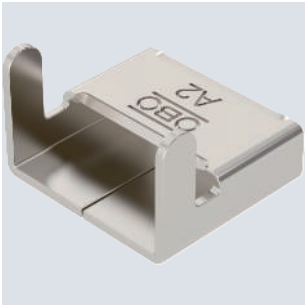

| Type | Colour | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **SBV 8 A2** | stainless steel | 100 | 0.250 | **6490942** |

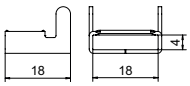
Tightening strap lock made of rustproof steel, suitable for portfolio with 8 mm width.

## SBV 15 tightening strap lock

A2 2B

CE




| Type | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **SBV 15 A2** | stainless steel | 100 | **6490964** |

Tightening strap lock made of rustproof steel, suitable for a range of products with a 15 mm width.

## Metal strip clips, narrow

A2 2B

| Type | Length mm | Width mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **MBS 015 A2** | 150 | 7.9 | 100 | 0.380 | **7203099** |
| **MBS 030 A2** | 300 | 7.9 | 100 | 0.610 | **7203103** |
| **MBS 045 A2** | 450 | 7.9 | 50 | 0.820 | **7203105** |
| **MBS 061 A2** | 610 | 7.9 | 50 | 1.080 | **7203107** |

Metal strip clip in a smooth finish with ball lock. For high-temperature and weather-resistant fastening. Use spring chuck MBS-Z for tightening.

A2 2B

## Metal strip clips, wide

| Type | Length mm | Width mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **MBS 075 A2** | 750 | 12 | 25 | 2.010 | **7203109** |
| **MBS 100 A2** | 1000 | 12 | 25 | 2.550 | **7203111** |
| **MBS 120 A2** | 1200 | 12 | 25 | 3.000 | **7203113** |
| **MBS 150 A2** | 1500 | 12 | 25 | 3.670 | **7203115** |

Metal strip clip in a smooth finish with ball lock. For high-temperature and weather-resistant fastening. Use spring chuck MBS-Z for tightening.

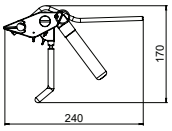
St

CE

## Spring chuck

| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **576** | 1 | **6498027** |

Clamping tool for all OBO tightening straps in conjunction with appropriate tightening strap locks. With high clamping force, ratchet function, shortening unit and round grips for pleasant handling.




St

## Pliers for metal strip clips

| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **MBS-Z** | 1 | **7203120** |

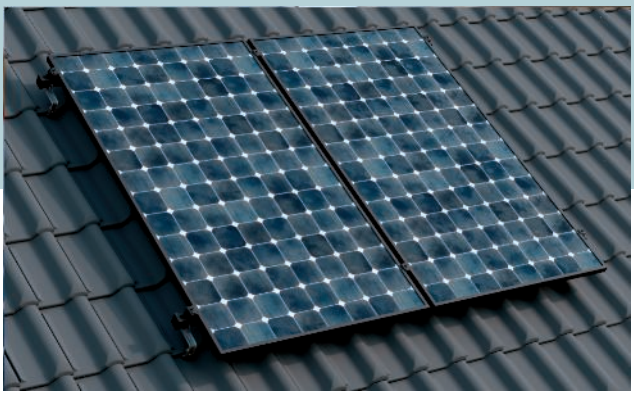
High-quality spring chuck with cutting tool for metal strip clips, type MBS.

# Magic PV Pitch
# Pitched-roof systems

Most pitched-roof systems are mounted on existing building roofs as so-called on-roof systems. Here, the PV modules are attached to the roof rafters using roof hooks, mounting rails and module clamps made of metal.

## Advantages at a glance

- Magic technology: Enables the profiles to be installed without screws or tools, thus saving time.
- Roof hook solution: Can be mounted on all standard pitched roof types and adjusted infinitely and down to the millimetre in all directions at any time.
- Universal clamp: Simultaneously functions as an intermediate or end clamp, covering a clamping range of 30–50 mm. For easy fixing of all standard PV modules.



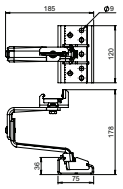
A2 2B

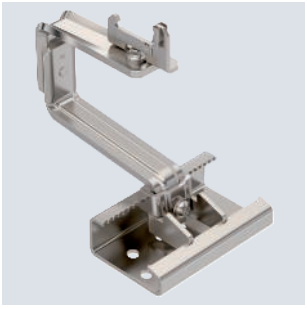
CE

## Universal roof hook for PV module mounting, tiled roof

| Type | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| DHU A2 | 10 | | 108.500 | 5901410 |

Roof hook to mount photovoltaic modules on pitched roofs in combination with the TP 45 support profile. Suitable for tiled roofs. Lockable fastening on support profile. Mounting on rafters with TKS wafer-head screws. Roof hook can be infinitely adjusted horizontally and vertically using glands, correct spanner Torx 40. Height adjustment in the range of the roof slat between 40–54 mm, side adjustment option up to 76 mm, height adjustment of the support profile up to 18 mm.





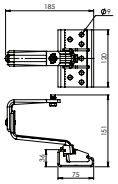
A2 2B

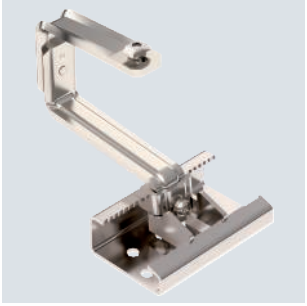
CE

## Roof hook for PV module mounting, screwable profile, tiled roof

| Type | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| DHU T A2 | 10 | | 100.700 | 5901404 |

Roof hook to mount photovoltaic modules on pitched roofs in combination with the TP 45 support profile. Suitable for tiled roofs. Screwable fastening on support profile. Mounting on rafters with TKS wafer-head screws. Roof hook can be infinitely adjusted horizontally and vertically using glands, correct spanner Torx 40. Height adjustment in the range of the roof slat between 40-54 mm, side adjustment option up to 76 mm, height adjustment of the support profile up to 18 mm.





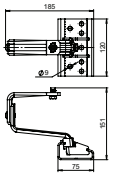
A2 P

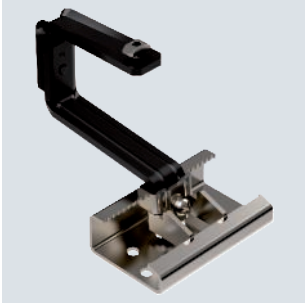
CE

## Roof hook for PV module mounting, screwable profile, tiled roof, black

| Type | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|
| DHU T A2K S | 10 | | 5901406 |

Roof hook to mount photovoltaic modules on pitched roofs in combination with the TP 45 support profile. Suitable for tiled roofs. Screwable fastening on the support profile. Mounting on rafters with TKS wafer-head screws. The roof hook can be adjusted horizontally as well as vertically continuously via glands, correct Torx 40 key. Height adjustment in the range of the roof slat between 40–54 mm, side adjustment option up to 76 mm, height adjustment of the support profile up to 18 mm. Black version.





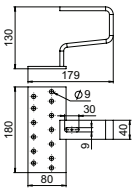
A2 GB

CE

## Heavy roof hooks for PV module mounting, tiled roof

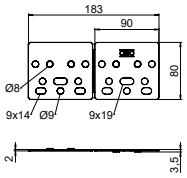
| Type | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| DHS A2 | 10 | | 137.000 | 5901416 |

Heavy roof hook to mount photovoltaic modules on pitched roofs in combination with the TP 45 support profile. Suitable for tiled roofs. Fastening on support profile through bolt with hammer nut, type SKSHM A2. Mounting on rafters with TKS wafer-head screws.



## Support plate for ceiling hooks

PE

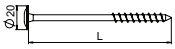



| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **UP DH** | 20 | 2.440 | **5901490** |

Polyethylene support plate for the height compensation of roof hooks, as used during the mounting of PV modules on sloping roofs. Suitable for universal roof hooks and heavy-duty roof hooks. A combination of multiple support plates is possible. Plate thickness max. 2 mm.

## Wafer-head screw for roof hooks

A2

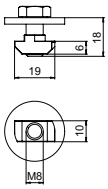



| Type | Length mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **TKS 8x100 A2** | 100 | 100 | 2.377 | **5901800** |
| **TKS 8x120 A2** | 120 | 100 | 2.789 | **5901802** |
| **TKS 8x200 A2** | 200 | 50 | 4.452 | **5901804** |

Wafer-head screw for fastening roof hooks to rafters when mounting photovoltaic modules on pitched roofs. Matching Torx 40 key.

## Screw with hammer nut for truss profile mounting on solar support tiles

A2




| Type | Thread | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **SKS HM A2** | M8 | 20 | 2.500 | **5901850** |

Screw with hammer nut for fastening the TP 45 truss profile to solar support tiles from manufacturers such as Fleck, Braas, Lehmann, Marzari and others.

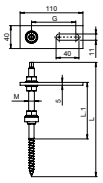
A2

CE

## Hanger bolt set for PV module mounting, trapezoidal/corrugated roof

| Type | Length mm | Diameter mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **STSS 10x200 A2** | 200 | 10 | 20 | | 26.690 | **5901820** |
| **STSS 12x200 A2** | 200 | 12 | 20 | | 32.800 | **5901826** |
| **STSS 12x300 A2** | 300 | 12 | 20 | | 39.620 | **5901828** |

Hanger bolt set to mount photovoltaic modules on pitched roofs in combination with the TP 45 support profile. Suitable for fastening in the wooden substructure of corrugated roofs made out of plastic, tin or fibre cement. Set consists of hanger bolt with pre-mounted EPDM seal, adapter plate for the support profile and additional nuts for the optional height adjustment. Fastening of the support profile with screw with slot nut, type SKS HM (please order separately).

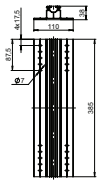


Alu BK

## Adapter for PV module mounting, trapezoidal roof

| Type | Min. ordering quantity Piece | | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **ADU TPD ALU** | 20 | | | 42.820 | **5901904** |

Short profile rail for mounting PV modules on trapezoidal roofs. Suitable for the universal terminal type KLU. With pre-mounted slip-resistant sealing mat, including fastening material.



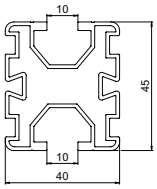
Alu BK

CE

## Support profile for PV module mounting

| Type | Length mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **TP 45 2350 ALU** | 2350 | 4 | | 242.520 | **5900405** |
| **TP 45 4700 ALU** | 4700 | 4 | | 485.040 | **5900410** |

Support profile to mount photovoltaic modules on flat and pitched roofs. Flat roof mounting in combination with UniBase universal stand and STK and STL short and long supports. Lockable fastening of the profile on the stand with UniBase AMP adapter. Pitched roof mounting in combination with universal DHU roof hook. Lockable fastening of the profile on roof hooks. Screwable connection of multiple support profiles with LV 45 straight connectors and KV 45 cross-connectors. With 10 mm groove on both sides to accept slide nuts and universal and earthing clamps.

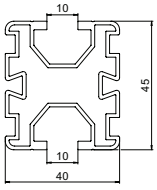


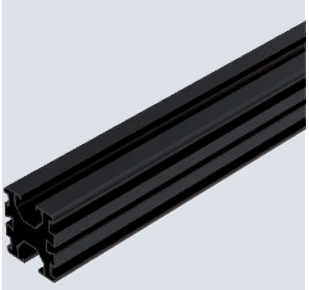

Alu EL

## Support profile for PV module mounting, black

| Type | Length mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **TP 45 4700 ALU S** | 4700 | 4 | | 485.040 | **5900412** |

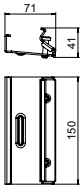
Support profile, black anodised, to mount photovoltaic modules on flat and pitched roofs. Flat roof mounting in combination with UniBase universal stand and STK and STL short and long supports. Lockable fastening of the profile on the stand with UniBase AMP adapter. Pitched roof mounting in combination with universal DHU roof hook. Lockable fastening of the profile on roof hooks. Screwable connection of multiple support profiles with LV 45 straight connectors and KV 45 cross-connectors. With 10 mm groove on both sides to accept slide nuts and universal and earthing clamps.



## Straight connector for TP support profile

St DD

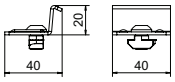



| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **LV 45 DD** | 20 | 38.600 | **5901210** |

Straight connector for TP support profiles. Can be screwed on with Torx 30 spanner.

## Cross-connector for TP support profiles

St DD

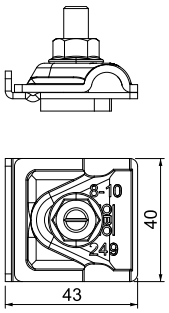



| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **KV 45 DD** | 20 | 5.000 | **5901250** |

Cross-connector for TP support profiles. Can be screwed on with Torx 40 spanner.

## Earthing terminal for PV mounting systems

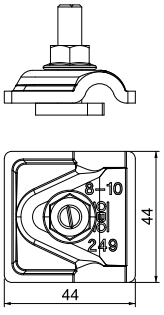
A2




| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **249 PV10 6-50V2A** | 40 | 43 | 34 | 8 | 8.460 | **5051520** |

Pre-mounted earthing terminal for the inclusion of PV mounting systems in the equipotential bonding. Suitable for the inclusion of the PV mounting systems in an external lightning protection system.
- Lightning current-compatible up to 100 kA (10/350)
- Rapid mounting through integrated spring mechanism
- For round conductor fastening RD 8–10
- To fasten single/multi-wire cables: 6–50 mm²
- For profiles with 10 mm groove
- Meets the requirements of DIN EN 62561-1

## Earthing terminal for PV mounting systems




| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|
| **249 PV8-10 ALU** | 44 | 44 | 34 | 10 | 4.500 | **5051526** |

Earthing terminal for the inclusion of PV mounting systems in the equipotential bonding.

- For round conductor fastening RD 8–10
- For profiles with 10 mm groove

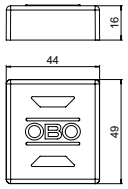
PE

CE

## Support profile end cap

| Type | Colour | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **EK 45 G** | Grey | 20 | 0.740 | **5901722** |

End cap for TP support profiles, as protection against injuries and contamination.



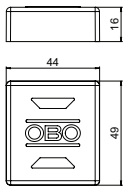

PE

CE

## Support profile end cap

| Type | Colour | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **EK 45 S** | Black | 20 | 0.740 | **5901720** |

End cap for TP support profiles, as protection against injuries and contamination.



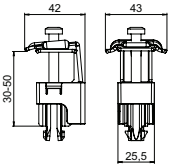

A2 BK

CE

## Universal clamp for PV module mounting

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLU A2** | 30-50 | 20 | 6.590 | **5901010** |

Universal clamp to mount photovoltaic modules on flat and pitched roofs, suitable as a clamp between 2 modules or as an end clamp. Lockable pre-fastening on TP 45 support profile and on STK and STL supports. Suitable for 10 mm slot width. Can be rotated through 90° after engaging. Lockable fastening of the PV module with Torx 30 wrench.



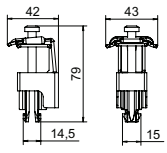

A2 K

CE

## Universal clamp for PV module mounting

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLU A2 S** | 30-50 | 20 | 6.590 | **5901012** |

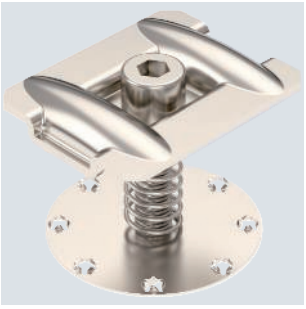
Universal clamp for mounting photovoltaic modules on flat and pitched roofs, suitable as a clamp between 2 modules or as an end clamp. Lockable pre-fastening on TP 45 support profile and on STK and STL supports. Suitable for 10 mm slot width. Can be rotated through 90° after engaging. Screwable fastening of the PV module with Torx 30 key. Black version.

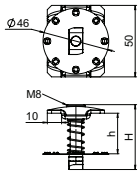



## Intermediate clamp with spring for PV module mounting

A2

CE





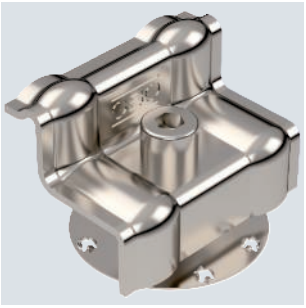

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLZ F 25 A2** | 25 | 50 | 6.150 | **5901062** |
| **KLZ F 30 A2** | 30 | 50 | 6.330 | **5901063** |
| **KLZ F 35 A2** | 35 | 50 | 6.620 | **5901064** |
| **KLZ F 40 A2** | 40 | 50 | 6.720 | **5901065** |

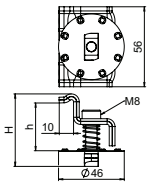
Intermediate clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

## End clamp with spring for PV module mounting

A2

CE






| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **KLE F 25 A2** | 25 | 50 | 7.850 | **5901092** |
| **KLE F 30 A2** | 30 | 50 | 8.210 | **5901093** |
| **KLE F 35 A2** | 35 | 50 | 8.770 | **5901094** |
| **KLE F 40 A2** | 40 | 50 | 9.620 | **5901095** |

End clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

# Magic PV Field
# Free-standing systems

Free-standing photovoltaics means the erection of PV modules on large areas not used for agriculture. Under favourable conditions, these photovoltaic systems can produce increased yields.

## Advantages at a glance

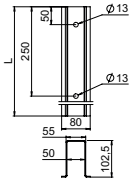
- The highest level of flexibility: Both rammed and anchored versions are available.
- Little installation work: We can offer you system components partly pre-mounted at the factory.
- Maximum mounting options: The profile with flexible length and perforation allows for almost any type of mounting.
- Besides the intended OBO terminals, also using standard fastening materials, such as standard bolts, is possible.

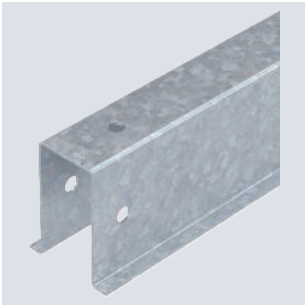
St FT

## Ramming pile, free-standing system

| Type | Length mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| **RP 1800 FT** | 1800 | 1 | 970.000 | **5900106** |
| **RP 2300 FT** | 2300 | 1 | 1,240.000 | **5900110** |

Ramming pile as a bracket for pre-mounted supports to mount free-standing photovoltaic systems. Mounting in the earth through ramming.



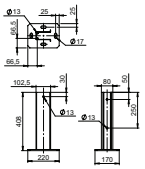



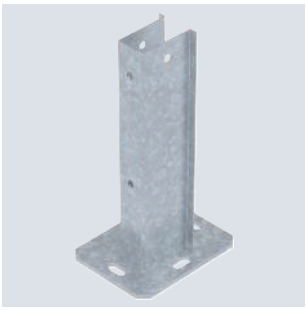
St FT

## Stand, free-standing system

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **SF 400 FT** | 1 | 431.000 | **5900900** |

Stand as a bracket for pre-mounted supports to mount free-standing PV systems. Mounting on concrete foundations with M16 bolt ties. Fastening material must be ordered separately.





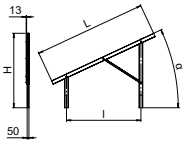
St FT

CE

## Pre-mounted supports for PV module mounting, free-standing system

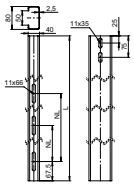
| Type | Angle α ° | Dim. H mm | Dim. L mm | Dim. l mm | Module height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|---|
| **VT 10S FT** | 10 | 1.38 | 2.71 | 2.27 | 20-50 | 1 | 2,900.000 | **5901550** |
| **VT 10M FT** | 10 | 1.41 | 3.12 | 2.27 | 20-50 | 1 | 3,150.000 | **5901552** |
| **VT 10L FT** | 10 | 1.45 | 3.49 | 2.27 | 20-50 | 1 | 3,350.000 | **5901554** |
| **VT 25S FT** | 25 | 2.00 | 2.52 | 2.09 | 20-50 | 1 | 3,250.000 | **5901556** |
| **VT 25M FT** | 25 | 2.09 | 2.90 | 2.09 | 20-50 | 1 | 3,450.000 | **5901558** |
| **VT 25L FT** | 25 | 2.16 | 3.24 | 2.09 | 20-50 | 1 | 3,650.000 | **5901560** |
| **VT 30S FT** | 30 | 2.19 | 2.41 | 1.99 | 20-50 | 1 | 3,350.000 | **5901562** |
| **VT 30M FT** | 30 | 2.29 | 2.78 | 1.99 | 20-50 | 1 | 3,550.000 | **5901564** |
| **VT 30L FT** | 30 | 2.29 | 2.78 | 1.99 | 20-50 | 1 | 3,750.000 | **5901566** |

Pre-mounted support in small, medium or large size to mount free-standing photovoltaic systems in combination with support profiles and end/connection clamps. Mounting with ramming piles in the earth or with stands on concrete foundations.




## Support profile for PV module mounting, free-standing system

St FT

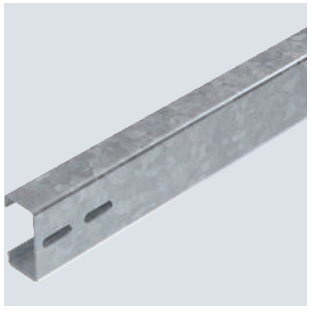


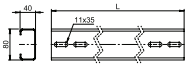
| Type | Length mm | Module width mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **TP 1000 FT** | 5650 | 990 - 1000 | 1 | 1,900.000 | **5900500** |
| **TP 1010 FT** | 5705 | 1000 - 1010 | 1 | 1,920.000 | **5900502** |
| **TP 1020 FT** | 5760 | 1010 - 1020 | 1 | 1,940.000 | **5900504** |
| **TP 1030 FT** | 5815 | 1020 - 1030 | 1 | 1,960.000 | **5900506** |
| **TP 1040 FT** | 5780 | 1030 - 1040 | 1 | 1,980.000 | **5900508** |
| **TP 1050 FT** | 5925 | 1040 - 1050 | 1 | 2,000.000 | **5900510** |
| **TP 1060 FT** | 5980 | 1050 - 1060 | 1 | 2,015.000 | **5900512** |
| **TP 1100 FT** | 5090 | 1090 - 1100 | 1 | 1,710.000 | **5900520** |
| **TP 1140 FT** | 5270 | 1130 - 1140 | 1 | 1,770.000 | **5900522** |
| **TP 1310 FT** | 6035 | 1300 - 1310 | 1 | 2,030.000 | **5900530** |

Support profile to mount photovoltaic modules on free-standing systems. Mounting of support profile on pre-mounted supports with KV FT cross-connectors. Mounting of the PV modules on the support profile with end and/or connection clamps. Connection of multiple support profiles with LV FT straight connectors and KV FT cross-connectors, screw-on.

## Support profile for PV module mounting, free-standing system

St FT





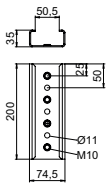
| Type | Length mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **TPU 6000 FT** | 6000 | 1 | **5900540** |

Support profile to mount photovoltaic modules on free-standing systems. Mounting of support profile on pre-mounted supports with KV FT cross-connectors. Mounting of the PV modules on the support profile with end and/or connection clamps of type KLE and/or KLZ. Connection of multiple support profiles with LV FT straight connectors and KV FT cross-connectors, screw-on.

## Straight connector for support profiles, free-standing system

St FT

CE



| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| **LV FT** | 20 | 59.000 | **5901215** |

Straight connector to connect support profiles for free-standing photovoltaic systems. Fastening with pre-installed hexagonal bolt M10, key size 17 mm.

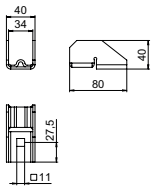
St FT

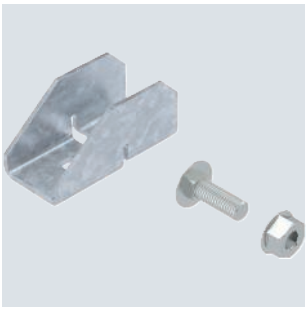
CE

## Cross-connector for TP support profiles, free-standing system

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| KV FT | 50 | 19.000 | 5901255 |

Cross-connector to connect support profiles for free-standing photovoltaic systems. Fastening with pre-installed M12 screw, screw-on with Torx 40 wrench.



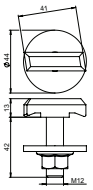
A2

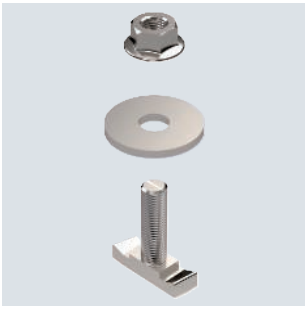
CE

## Hook-head bolt for free-standing systems

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| MS50HB M12x45 A2 | 25 | 14.750 | 5901865 |

Hook-head bolt for the use with profile rail MS4022, in free-standing PV mounting systems.



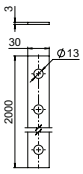
St FT

CE

## Perforated strip for PV free-standing system

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| LB FT | 10 | 144.000 | 5901950 |

Perforated strip for cross-connecting the rear supports of pre-mounted supports type VT 10/25/30. For stiffening PV mounting systems free-standing. Fastening with screw set for perforated strip type SVLB. Fastening material not included in scope of delivery.



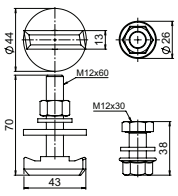

A2

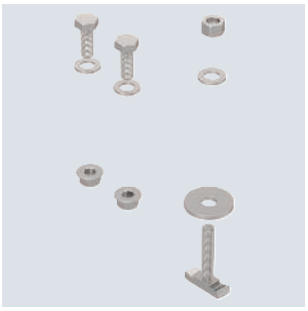
CE

## Screw set for perforated strip

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| SVLB | 1 | 23.800 | 5901960 |

Screw set including hexagonal screws M12, hexagonal nuts with flange M12, hook-head bolt and washers. For the fastening of perforated straps, type LB FT, on rear supports on pre-assembled beams of PV open-field mounting systems.

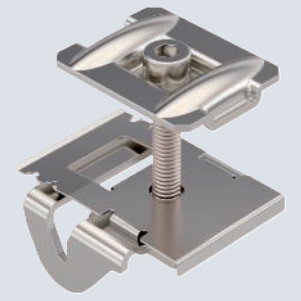


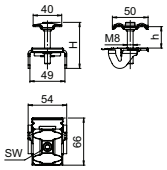



## Intermediate clamp for PV module mounting, free-standing system

A2

CE





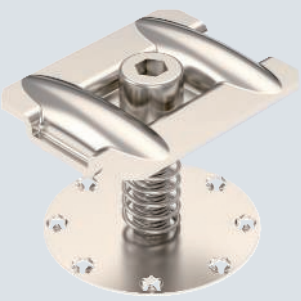

| Type | For frame height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **KLZ 2030 A2** | 20-30 | 50 | | 13.800 | **5901050** |
| **KLZ 3040 A2** | 30-40 | 50 | | 14.400 | **5901054** |
| **KLZ 4050 A2** | 40-50 | 50 | | 14.800 | **5901058** |

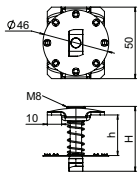
Connection clamp for fastening photovoltaic modules on support profiles of free-standing systems. Lockable pre-fastening of the module frames on the support profile. Suitable for slot width 10 mm. Screwable fastening of the PV module with size 6 Allen key.

## Intermediate clamp with spring for PV module mounting

A2

CE





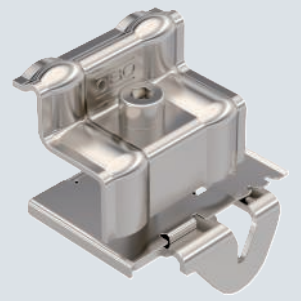

| Type | For frame height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **KLZ F 25 A2** | 25 | 50 | | 6.150 | **5901062** |
| **KLZ F 30 A2** | 30 | 50 | | 6.330 | **5901063** |
| **KLZ F 35 A2** | 35 | 50 | | 6.620 | **5901064** |
| **KLZ F 40 A2** | 40 | 50 | | 6.720 | **5901065** |

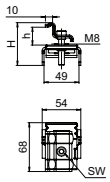
Intermediate clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.

## End clamp for PV module mounting, free-standing system

A2

CE






| Type | For frame height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|
| **KLE 20 A2** | 20 | 50 | | 16.000 | **5901070** |
| **KLE 25 A2** | 25 | 50 | | 16.900 | **5901072** |
| **KLE 30 A2** | 30 | 50 | | 17.400 | **5901074** |
| **KLE 35 A2** | 35 | 50 | | 18.300 | **5901076** |
| **KLE 40 A2** | 40 | 50 | | 18.800 | **5901078** |
| **KLE 45 A2** | 45 | 50 | | 19.700 | **5901080** |
| **KLE 50 A2** | 50 | 50 | | 20.200 | **5901082** |

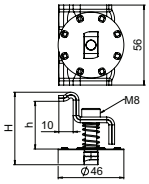
End clamp for fastening photovoltaic modules on support profiles of free-standing systems. Lockable pre-fastening of the module frames on the support profile. Suitable for slot width 10 mm. Screwable fastening of the PV module with size 6 Allen key.

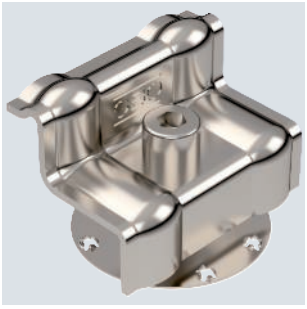
A2

## End clamp with spring for PV module mounting

| Type | For frame height mm | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|
| KLE F 25 A2 | 25 | 50 | 7.850 | 5901092 |
| KLE F 30 A2 | 30 | 50 | 8.210 | 5901093 |
| KLE F 35 A2 | 35 | 50 | 8.770 | 5901094 |
| KLE F 40 A2 | 40 | 50 | 9.620 | 5901095 |

End clamp with spring for fastening photovoltaic modules on support profiles. Suitable for slot width 10 mm. Lockable fastening of the PV module with Allen key size 6.



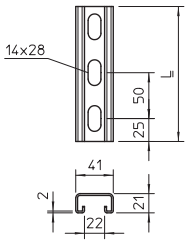



St FT

## MS4121 mounting rail, slot 22 mm, perforated

| Type | Length mm | Material thickness mm | BS | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| MS4121P2000FT | 2000 | 2 | | 2 | 1122923 |
| MS4121P3000FT | 3000 | 2 | | 3 | 1122924 |
| MS4121P6000FT | 6000 | 2 | | 6 | 1122926 |

Heavy-duty C profile rail for individual installation of support constructions, e.g. for cable trays or as a panel for switchgear cabinets. Can also be used for cable routing, in conjunction with clamp clips with a U foot.




St FT

## Wall and support bracket AW 30

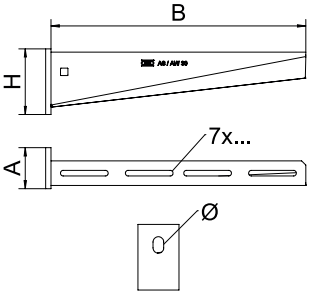
| Type | Width mm | F in kN | BS | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| AW 30 11 FT | 110 | 3 | | 1 | 6419704 |
| AW 30 21 FT | 210 | 3 | | 1 | 6419720 |
| AW 30 31 FT | 310 | 3 | | 1 | 6419747 |
| AW 30 41 FT | 410 | 3 | | 1 | 6419763 |
| AW 30 51 FT | 510 | 3 | | 1 | 6419798 |
| AW 30 61 FT | 610 | 3 | | 1 | 6419828 |

Fastening of the bracket to the U support of width 400 mm or greater using a hexagonal bolt through both sides of the support. Please insert suitable spacers.

Medium-duty wall and support bracket with welded head plate.

| Type | Dim. B mm | Dim. A mm | Dim. H mm | Hole Ø mm |
|---|---|---|---|---|
| AW 30 11 FT | 110 | 50 | 60 | 11 |
| AW 30 21 FT | 210 | 50 | 70 | 13 |
| AW 30 31 FT | 310 | 50 | 80 | 13 |
| AW 30 41 FT | 410 | 50 | 80 | 13 |
| AW 30 51 FT | 510 | 50 | 90 | 13 |
| AW 30 61 FT | 610 | 50 | 100 | 13 |

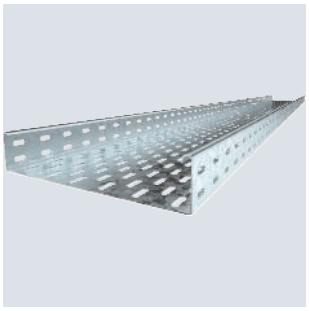
**Dimensions**



## Cable tray SKS 60

St FT

CE UK CA E30 E60 E90

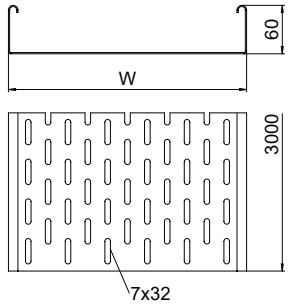


| Type | Width mm | Metal thick-ness mm | Min. order-ing quan-tity m | Item no. |
|---|---|---|---|---|
| **SKS 610 FT** | 100 | 1.50 | 3 | **6056636** |
| **SKS 620 FT** | 200 | 1.50 | 3 | **6056652** |
| **SKS 630 FT** | 300 | 1.50 | 3 | **6056679** |
| **SKS 640 FT** | 400 | 1.50 | 3 | **6056695** |
| **SKS 650 FT** | 500 | 1.50 | 3 | **6056717** |
| **SKS 660 FT** | 600 | 1.50 | 3 | **6056733** |

The cable tray, type SKS, should also be used for the maintenance of electrical function. For additional data, please refer to BSS fire protection systems.

SKS 60 = Heavy-duty cable tray system with 60 mm side height.

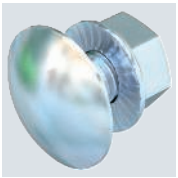
**Dimensions**

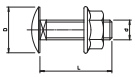



| Type | Length mm | Dimension W mm | Usable cross-section cm² |
|---|---|---|---|
| SKS 610 FT | 3000 | 100 | 58 |
| SKS 620 FT | 3000 | 200 | 118 |
| SKS 630 FT | 3000 | 300 | 178 |
| SKS 640 FT | 3000 | 400 | 238 |
| SKS 650 FT | 3000 | 500 | 298 |
| SKS 660 FT | 3000 | 600 | 358 |

## Truss-head bolt with flange nut

St F





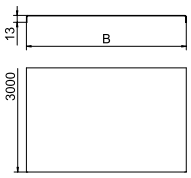
| Type | Dimen-sion mm | Dim. L mm | Dim. d mm | Dim. D mm | Resist-ance grade | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **FRSB 6x12 F** | M 6 x 12 | 12 | 6 | 13.5 | 5.6 | 100 | **6406122** |

Truss-head bolt with square neck including flange nut.

## Unperforated cover

St DD

CE UK CA




| Type | Dim. B mm | Metal thick-ness mm | Length mm | Min. order-ing quan-tity m | Item no. |
|---|---|---|---|---|---|
| **DRLU 100 DD** | 100 | 1.00 | 3000 | 3 | **6052643** |
| **DRLU 200 DD** | 200 | 1.00 | 3000 | 3 | **6052650** |
| **DRLU 300 DD** | 300 | 1.00 | 3000 | 3 | **6052656** |
| **DRLU 400 DD** | 400 | 1.00 | 3000 | 3 | **6052662** |
| **DRLU 500 DD** | 500 | 1.50 | 3000 | 3 | **6052668** |
| **DRLU 600 DD** | 600 | 1.50 | 3000 | 3 | **6052674** |

Cover for cable trays and mesh cable trays.

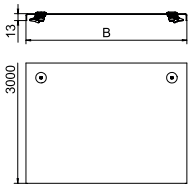
When using covers outdoors, additional measures against the influence of wind must be taken.

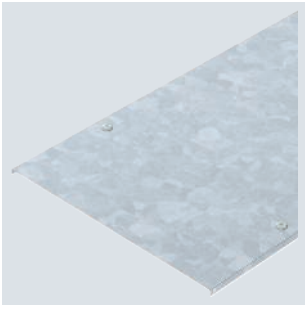
Transverse bead from 500 mm width.

St FT

## Cover with turn buckle

| Type | Dim. B mm | Metal thickness mm | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| DRL 100 FT | 100 | 1.00 | 3000 | 3 | 6051340 |
| DRL 200 FT | 200 | 1.00 | 3000 | 3 | 6051367 |
| DRL 300 FT | 300 | 1.00 | 3000 | 3 | 6051383 |
| DRL 400 FT | 400 | 1.50 | 3000 | 3 | 6051413 |
| DRL 500 FT | 500 | 1.50 | 3000 | 3 | 6051448 |
| DRL 600 FT | 600 | 1.50 | 3000 | 3 | 6051472 |



Transverse bead from 500 mm width.

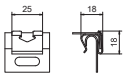
Cover for cable trays and cable ladders with three pairs of turn buckles.

When using covers outdoors, additional measures against the influence of wind must be taken.

A2 2B

## Cover clamp

| Type | Min. ordering quantity Piece | Weight kg/100 pc. | Item no. |
|---|---|---|---|
| DK DRLU A2 | 30 | 0.842 | 6052810 |



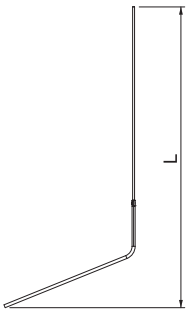

Cover clamp for secure fastening of covers on cable trays and cable ladders.

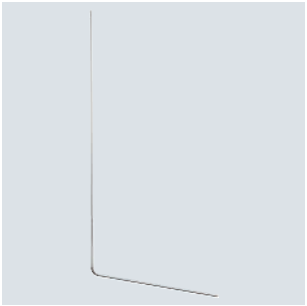
At least 6 cover clamps should be mounted for each 3 metres of cover.

Alu

## Angled air-termination rod for PV frames

| Type | Length mm | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| 101 VL2000 112 | 2000 | 10/16 | 10 | 5401950 |



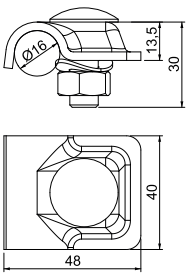



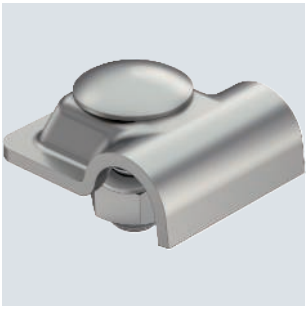
- Suitable for wind loads according to Eurocode 1: DIN EN 1991-1-4
- Last metre is tapered from Ø 16 mm to Ø 10 mm, material: AlMgSi
- Angled to 112°

A2

## Quick connector RD 16

| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| 249 16 VA 101 VL | 20 | 5311610 |



- To fasten round conductors RD 16

# External lightning protection

## Lightning protection for roof systems


The inclusion of a photovoltaic system into the existing lightning protection concept of a building is often neglected during refitting work. This significantly increases the risk of considerable damage through a direct lightning strike.
For public buildings, for example, the LBO (state construction regulations) require a lightning protection system as fire and personal protection.

## Complete product range, decades of experience

Our comprehensive product range, tested in the OBO BET laboratory, and our experience mean that we can offer the right solutions for almost any type of system. Lightning strikes are intercepted safely and run to the earth in a controlled manner with the following OBO systems:

- Air-termination rods
- Rod holders
- Ridge conductor holders
- Roof conductor holder for ridge tiles
- Roof conductor holders for various roofing types
- Conventional insulated lightning protection
- Insulated isCon® lightning protection system
- Conductor bracket
- Round and flat conductors
- Connection clamps and connection terminals

**Our products are available in four different materials:**

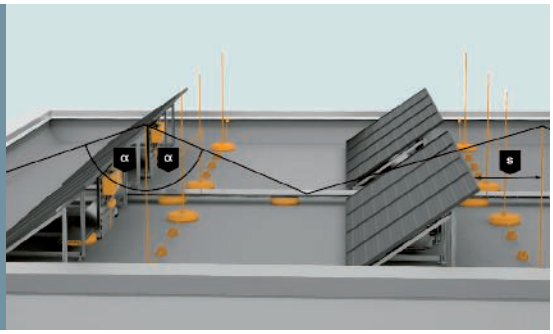
- Steel, hot-dip galvanised
- Copper
- Aluminium
- Stainless steel

BET TESTCENTER

# Five steps to comprehensive protection of PV systems

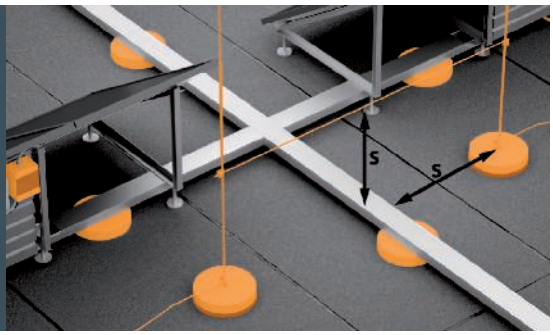
## Step 1:

**Lightning protection**
Establish protection areas for buildings and PV modules.



## Step 2

**Check the separation distance**
If the required separation distance cannot be complied with, then the metallic parts must be interconnected to be able to carry lightning current.

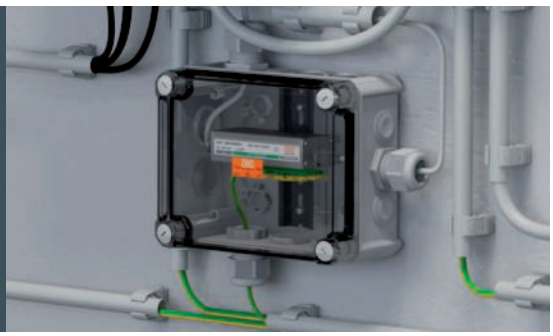



## Step 3

**Check the protection measures**
Measures for lightning protection equipotential bonding and surge protection are used on the DC and the AC side, e.g. lightning current arrester (type 1) and surge arrester T2.

## Step 4

**Include data cables**
Data cables must be included in the protection concept.



## Step 5

**Carry out the equipotential bonding**
Local equipotential bonding must be provided on the inverter.

| Übersicht der Schutzmaßnahmen | | | | | |
|---|---|---|---|---|---|
| **Ausgangssituation** | **Maßnahme** | **Trennungsabstand nach DIN EN 62305 eingehalten** | **Potentialausgleich** | **Überspannungsschutz** | **Beispielhafte Produktabbildung** |
| Äußere Blitzschutzanlage (gemäß DIN EN 62305)  | Blitzschutzsystem nach DIN EN 62305 anpassen | Ja | min. 6 mm² | DC: Typ 2<br>V20-C 3PH-1000<br>5094608 |  |
| | | | | AC: Typ 1+2<br>V50 3+NPE<br>5093526 |  |
| | | Nein | min. 16 mm² | DC: Typ 1+2<br>PV-T1+2-1100<br>5094250 |  |
| | | | | AC: Typ 1+2<br>V50 3+NPE<br>5093526 |  |
| Keine äußere Blitzschutzanlage Erdleitungsanschluss  | Prüfung der Forderungen: LBO, VdS 2010, Risikoanalyse | – | – | DC: Typ 2<br>V20-C 3PH-1000<br>5094608 |  |
| | | | | AC: Typ 2<br>V20 3+NPE<br>5095253 |  |

# Planning process

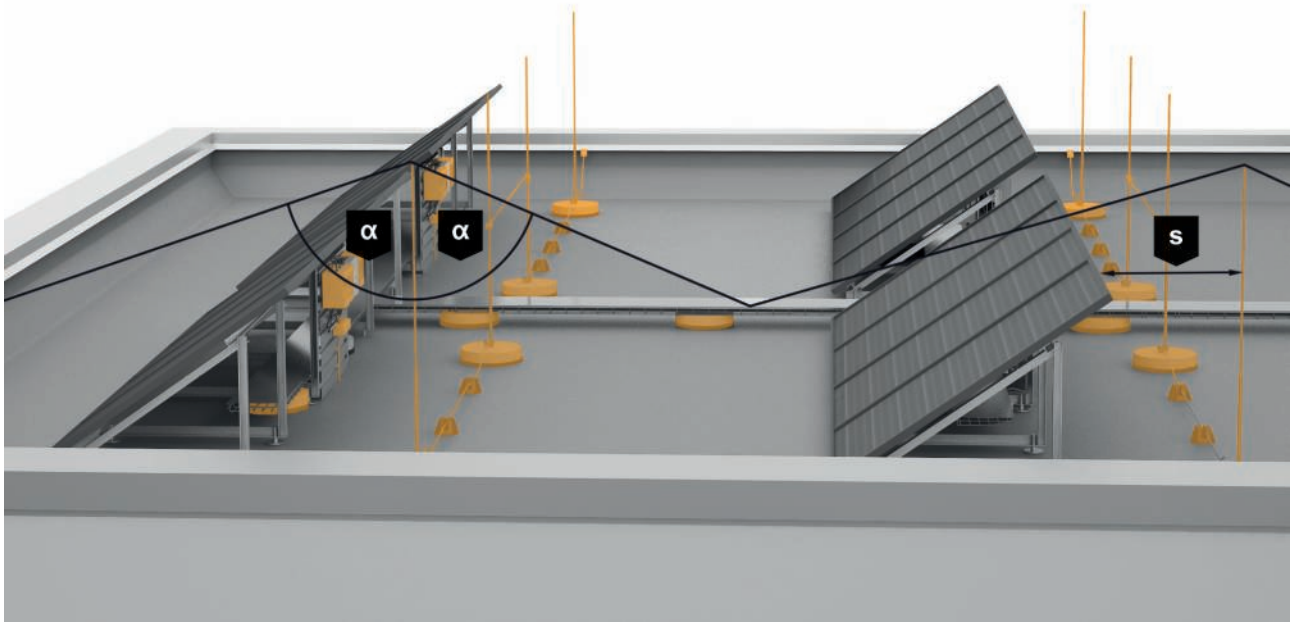
Different planning processes can be used for positioning the air-termination rods: The protective angle method and the rolling sphere method. On the following pages, we present these to you in detail.

## Protective angle method

Using the protective angle method is only advisable in simple or small buildings and for individual building sections. It should therefore only be used where the building is already protected with air-termination rods whose positions were determined using the rolling sphere or grid method. The protective angle method is well suited for positioning air-termination rods providing merely additional protection for a small number of protruding building parts or structures.

All roof structures must be protected with air-termination rods. Here, it is necessary to observe the relevant separation distance (s) between earthed roof structures and metal systems. If the roof structure has a conductive continuation into the building (e.g. with a stainless steel pipe with a connection to the ventilation or air-conditioning system), then the air-termination rod must be erected at the separation distance (s) from the object to be protected. This distance safely prevents arcing of the lightning current and dangerous spark creation.

| | |
|---|---|
| α | Protective angle |
| s | Separation distance |




*Protective angle and separation distance of air-termination rods on a photovoltaic system*

The protective angle (α) for air-termination rods varies according to the lightning protection class. You can find the protective angle (α) in the table below for the most common air-termination rods of up to 2 m in length.

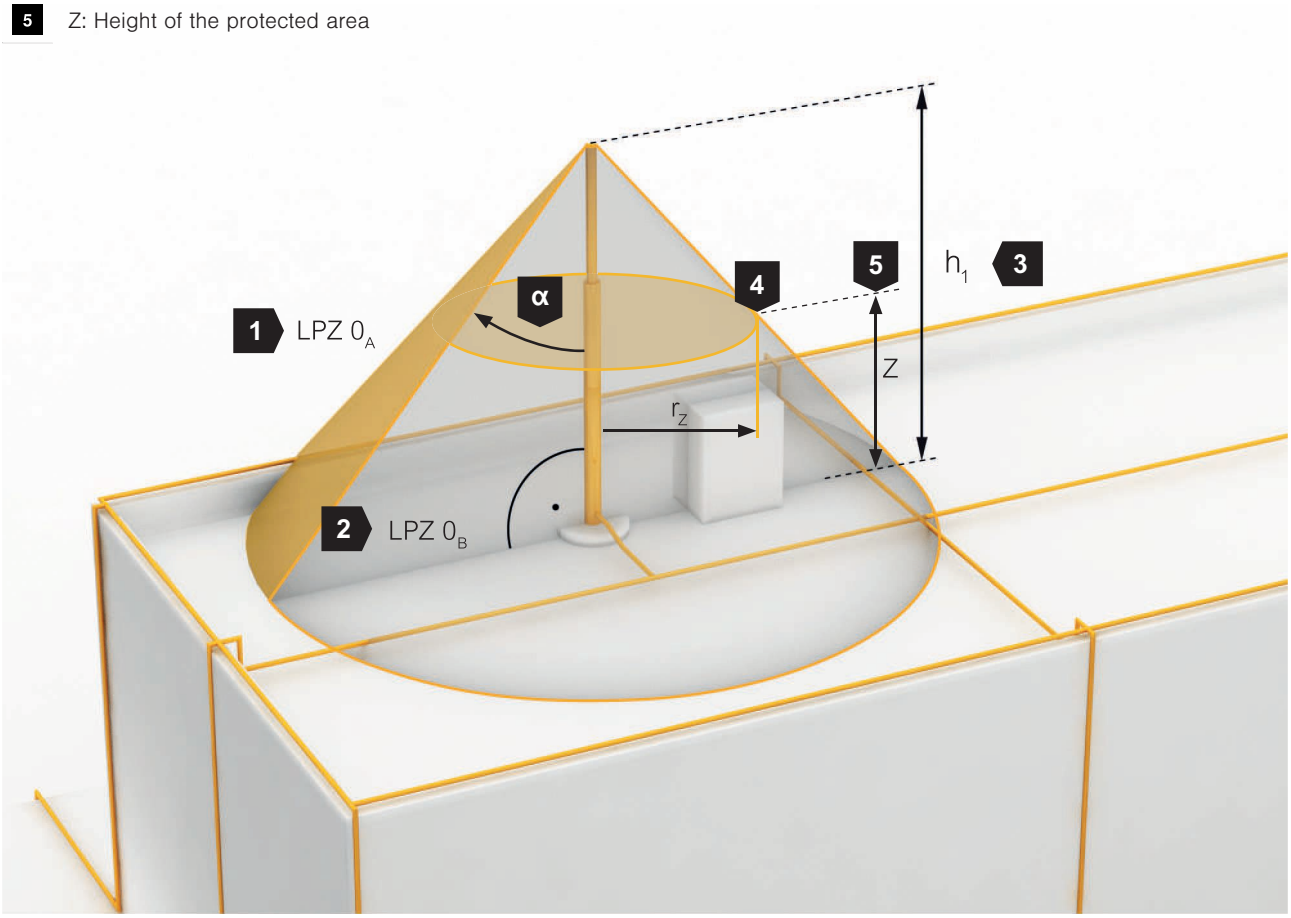
The structure to be protected (e.g. a building part or device) must be fitted with one or several air-termination rods in such a way that the structure fits fully underneath a cone sheath formed by the tips of the air-termination rods and whose top angle is taken from the table.

The areas bordered by the horizontal plane (roof surface) and the areas enclosed by the cone sheath can be considered protected areas. Should the height of the roof object to be protected be known, then the formula
*rz =(h1 –z)×tan (α)*
can be used to determine the protection area of the air-termination rod or a formula conversion can be used to determine the required air-termination rod length.

| Lightning protection class | Protective angle α for air-termination rods up to 2 m in length |
|---|---|
| I | 70° |
| II | 72° |
| III | 76° |
| IV | 79 |

Protective angle based on lightning protection class according to VDE 0185-305-3 (IEC 62305-3) for air-termination rods up to 2 m in length

| | |
|---|---|
| α | Protective angle |
| 1 | LPZ $0_A$: Danger posed by direct lightning strikes |
| 2 | LPZ $0_B$: Protected from direct lightning strikes but at risk |
| 3 | $h_1$: Air-termination rod height |
| 4 | $r_Z$: Radius of the protected area |
| 5 | Z: Height of the protected area |



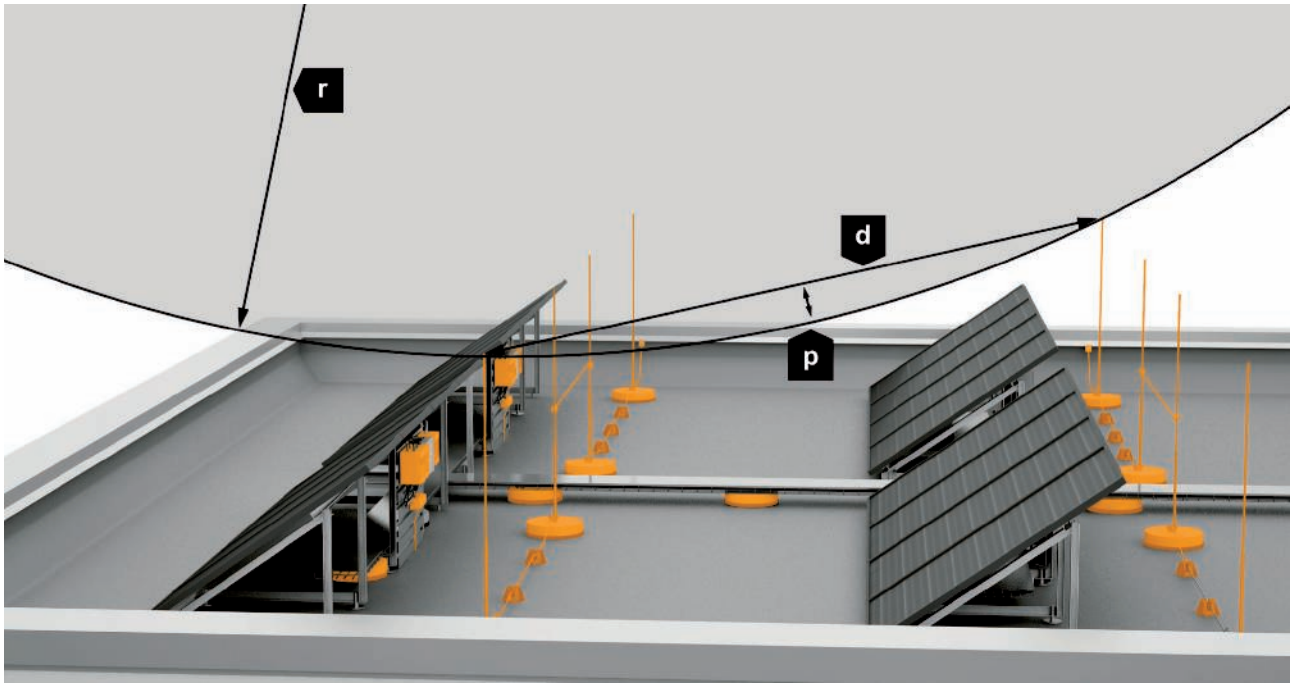

*Protected area of an air-termination rod calculated with the simplified protective angle method*

# Rolling sphere method: Protect roof structures with multiple air-termination rods

If you use several air-termination rods to protect an object, you must take into consideration the penetration depth between them. For a brief overview, see the table below or, to calculate the penetration depth, use the following formula:

$$p = r - \sqrt{r^2 - \left(\frac{d}{2}\right)^2}$$

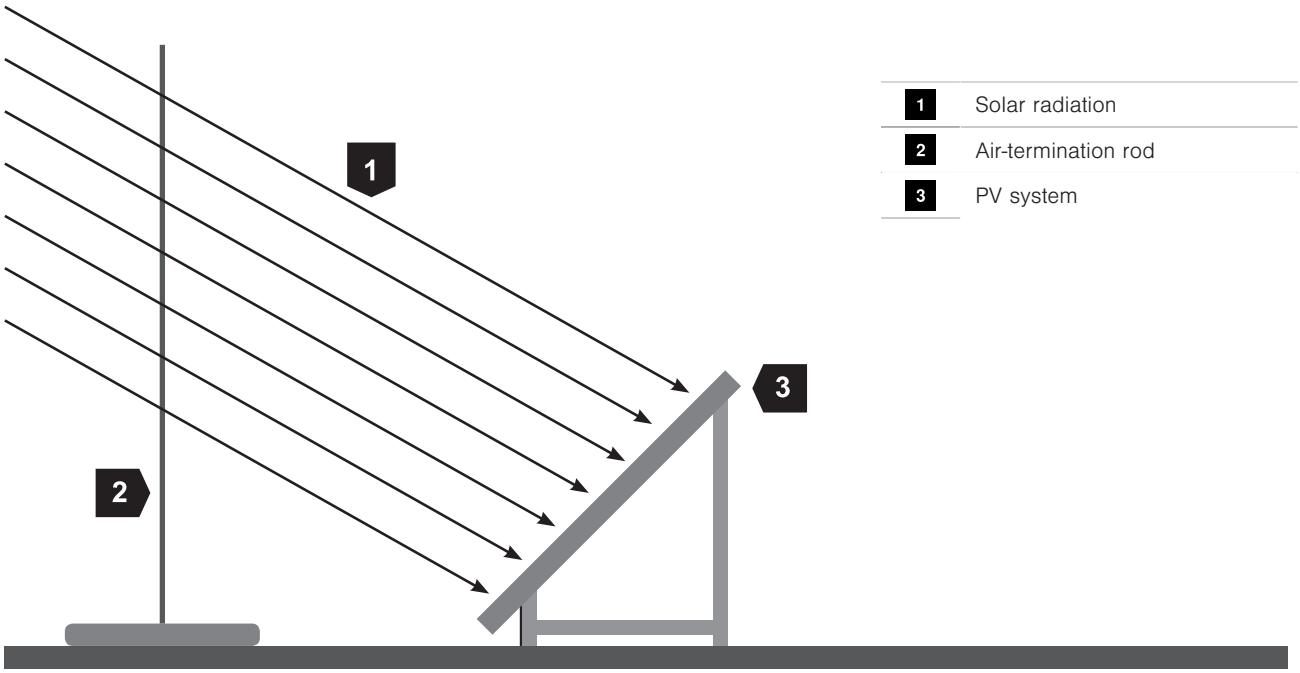
| | |
|---|---|
| p | Penetration depth |
| r | Radius of rolling sphere |
| d | Distance of Air-termination system |




*Penetration depth (p) according to the lightning protection class according to VDE 0185-305 (IEC 62305)*

| Distance of air-termination system (d) in m | Penetration depth, lightning protection class I, rolling sphere: r = 20 m | Penetration depth, lightning protection class II, rolling sphere: r = 30 m | Penetration depth, lightning protection class III, rolling sphere: r = 45 m | Penetration depth, lightning protection class IV, rolling sphere: r = 60 m |
|---|---|---|---|---|
| 2 | 0.03 | 0.02 | 0.01 | 0.01 |
| 3 | 0.06 | 0.04 | 0.03 | 0.02 |
| 4 | 0.10 | 0.07 | 0.04 | 0.04 |
| 5 | 0.16 | 0.10 | 0.07 | 0.05 |
| 10 | 0.64 | 0.42 | 0.28 | 0.21 |
| 15 | 1.46 | 0.96 | 0.63 | 0.47 |
| 20 | 2.68 | 1.72 | 1.13 | 0.84 |

Penetration depth (p) according to the lightning protection class according to VDE 0185-305 (IEC 62305)




*An air termination rod casting a shadow on a PV module*

## Avoiding shade from the lightning protection system

The position of the air-termination rods should be chosen so that there is no shading of the PV modules. This is because a core shadow can cause performance reductions of the whole string.

For this reason, an air-termination rod must be at least 108 x diameter from the PV module (DIN EN 62305-3 Suppl. 5). Please note that the PV system must remain in the protection area of the air-termination rod.

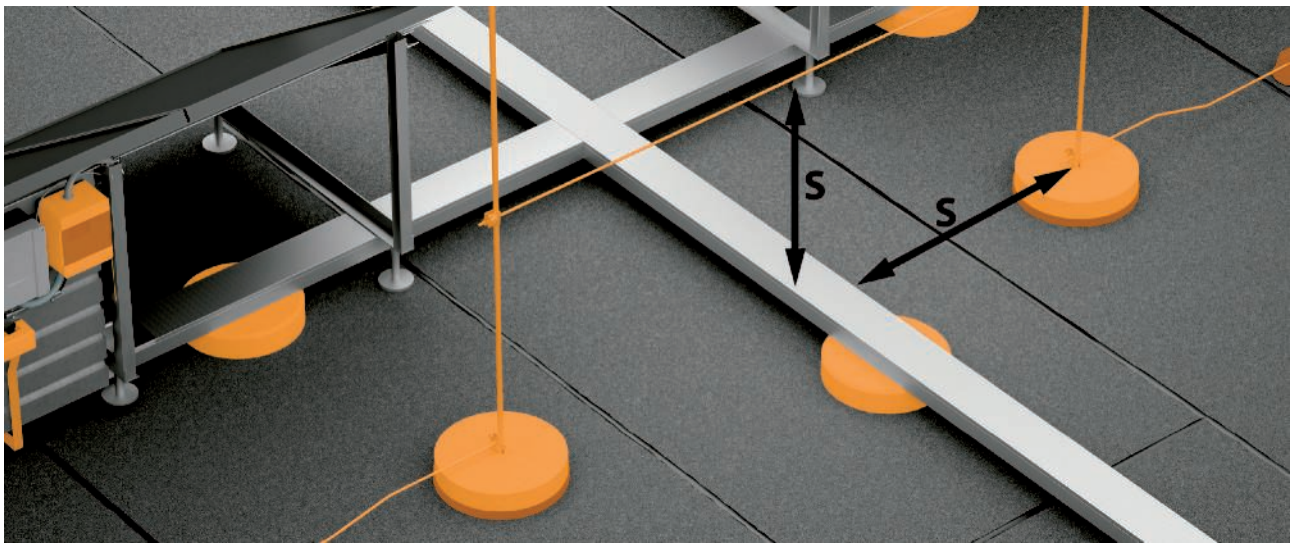
| Diameter of the air-termination system (m) | Distance between the air-termination system and the PV module (m) |
|---|---|
| 0.008 | 0.86 |
| 0.010 | 1.08 |
| 0.016 | 1.73 |

Minimum distance from the air-termination systems, to avoid a core shadow

# Plan the distance, increase the protection

*Insulated lightning protection with OBO isCon® to maintain the separation distance (s)*

The physical distance of a PV system to the external lightning protection system should be maintained as much as possible, in order to protect it. The typical values are between 0.5 m and 1 m. If this is not possible due to local circumstances, then the necessary distance may be undershot, if the system is included in the external lightning protection system or an insulated system is being created, e.g. with the high-voltage-resistant, insulated isCon® conductor.




*Isolated lightning protection with correctly maintained separation distance (s)*

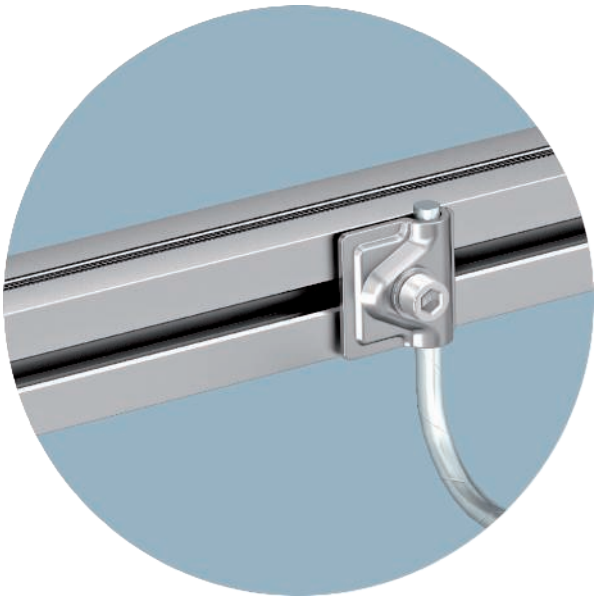
# The decisive factor: The separation distance (s)

If there is an adequate distance between the conductor through which the lightning current flows and the metallic building parts, the risk of flashover, e.g. on the supply lines to the inverter, is virtually eliminated. This distance is described as the separation distance (s).

**The separation distance (s) does not prevent inductively coupled surge voltages!**

$$s = k_i \frac{k_c}{k_m} L(m)$$

*Formula for calculating the separation distance*



*Lightning protection equipotential bonding system on PV mounting system*

| | |
|---|---|
| $k_i$ | Dependent on the selected protection class of the lightning protection system |
| $k_c$ | Dependent on the (partial) lightning current that flows in the conductors |
| $k_m$ | Dependent on the material of the electrical insulation |
| L (m) | Vertical distance from the point at which the separation distance (s) is to be calculated up to the closest point of the equipotential bonding |

*Lightning protection conductor on a rainwater downpipe*

*Direct connection of the PV mounting frames to the lightning protection system*

## If the separation distance cannot be maintained

If the separation distance according to VDE 0185-305-3 (IEC/EN 62305-3) cannot be maintained for construction reasons, then the PV system must be connected to the lightning protection system using tested components with 16 mm2 CU or 50 mm² aluminium (RD8).

Lightning protection components for connection must be tested according to VDE 0185-561-1 (IEC/ EN 62561-1). In these cases, type 1 (class I) surge protective devices or combination arresters of type 1+2 (class I+II) are required on the DC side, as lightning currents cannot be managed within buildings.

The necessary lightning protection equipotential bonding achieved in this way connects all the metallic and electrically conductive components of the system, including the earthing system, with the standardised lightning protection system. According to VDE 0185-305 Parts 3 and 4 (IEC/ EN 62305-3, -4), surge protective devices (SPDs) of type 1 (class I) or combination arresters of type 1+2 (class I+II) must be used for the cables running into the building.

This applies both on roofs and on the ground, and for the AC and the DC side of the PV power supply system. Of importance for the question regarding the necessity of surge protection measures are DIN VDE 0100-443 (VDE 0100-443) and DIN VDE 0100-712 (VDE 0100-712).

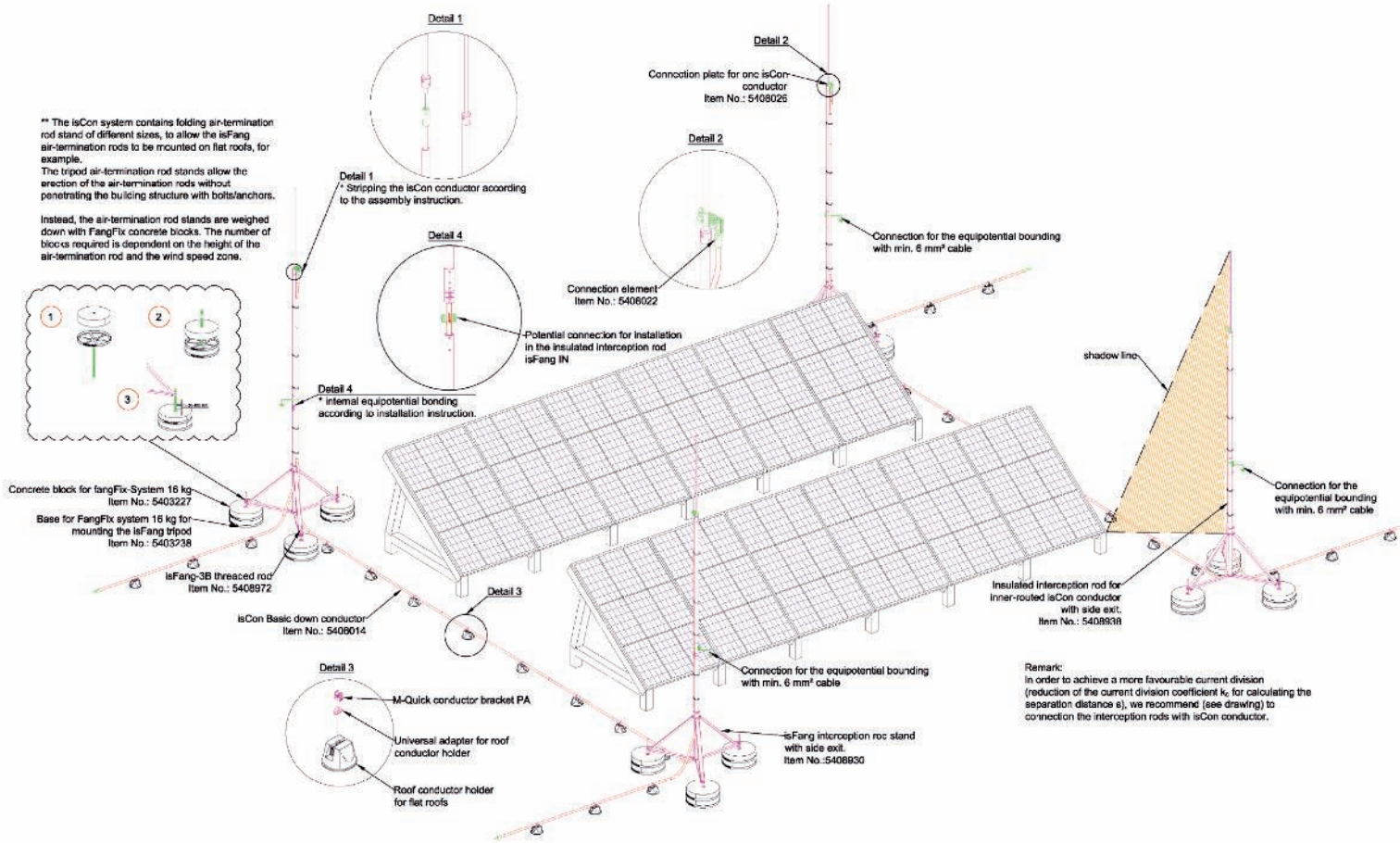
*SPD type 1+2 for the PV DC side*

# Metallic building components and external lightning protection

A separation distance does not have to be observed in buildings with cross-connected, durable walls and roofs or with cross-connected metal facades and metal roofs. Metallic components with no conductive lead into the building to be protected, and whose distance to the conductor of the external lightning protection system is less than one metre, must be connected directly to the lightning protection system. These include, although are not limited to, metallic railings, doors, pipes (with non-flammable and/or explosive contents) and facade elements.

## The safe solution: OBO isCon®

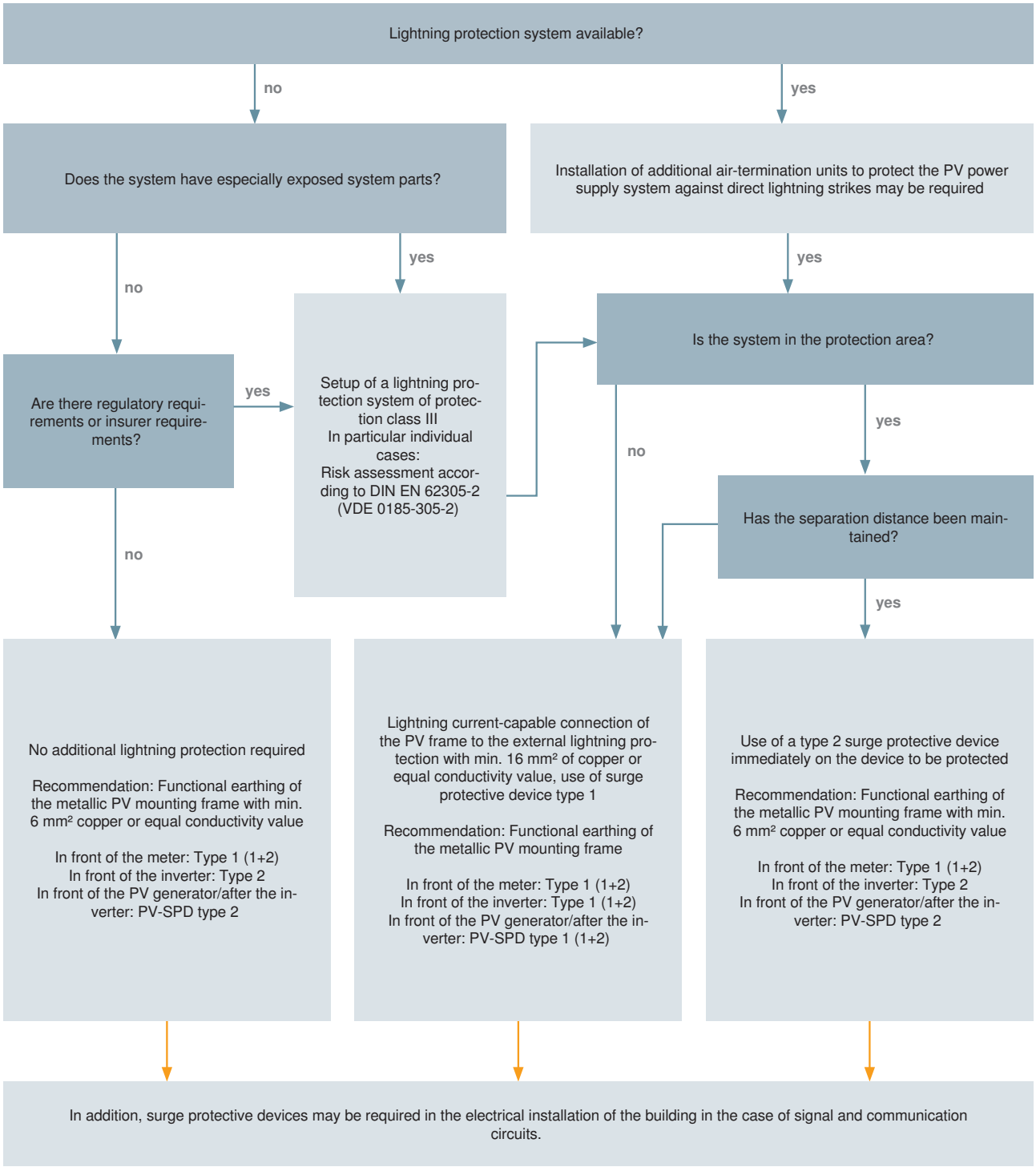
The separation distance can be maintained safely using the high-voltage-resistant, insulated isCon® system from OBO. The insulated isFang air-termination systems with the isCon® conductor are tested according to VDE V 0185-561-8 (IEC TS 62561-8) and, with correct planning, can minimise shading. This increases the cost-effectiveness of the entire system.




*Example of a planned, insulated lightning protection system with isCon®*

# Selection of protection measures

*according to DIN EN 62305-3 Suppl. 5 (VDE 0185-305-3 Suppl. 5):2014-02*



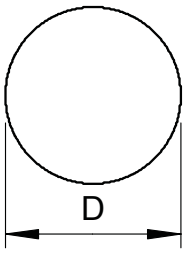

**Relevant standard**

- VDE 0185-305-1 to -4 (IEC 62305-1 to -4)
- E DIN VDE 0100-712
- DIN VDE 0185-305-3, Supplement 5

*This data makes no claim to completeness! Please observe the appropriate local and statutory requirements.*

## Round conductor, aluminium

Alu

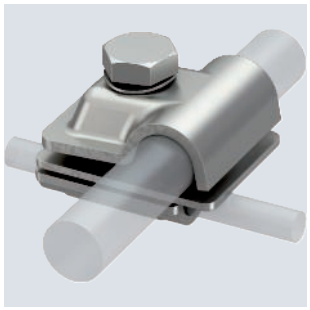


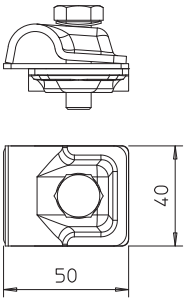

| Type | Nominal size Ø mm | Cross-section mm² | Normal ring ca. m | Normal ring ca. kg | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|---|
| **RD 8-ALU-T** | 8 | 50 | 150 | 20 | 150 | **5021294** |
| **RD 8-ALU-T 75** | 8 | 50 | 75 | 10 | 75 | **5021296** |

- According to DIN EN 62561-2 (VDE 0185-561-2)
- Corresponds to the requirements of VDE 0185-305 (IEC 62305)
- RD 8 ALU: Semi-hard (E-AlMgSi0.5 corresponds to DIN 48801)
- RD 8 ALU-T: Can be subjected to torsion (E-AlMgSi0.5 corresponds to DIN 48801)
- RD 10 ALU: Pure aluminium (E-Al corresponds to DIN 48801)
- AL and ALMgSi may not be routed directly on, in or under plaster, mortar or concrete, nor routed in the earth

## Vario quick connector Rd 8-10x16

A2



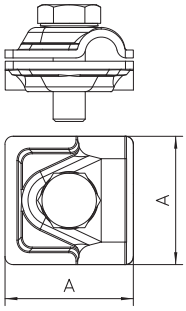



| Type | Fit mm | Dim. A mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **249 8-10X16 VA** | 8-10x16 | 40 | H/100 | 10 | **5311590** |

- For T, cross-over and parallel connections with adapter plates
- Quick mounting using an M10 x 30 bolt, made from rustproof stainless steel
- With sprung washer to DIN 137
- Corresponds to the requirements of VDE 0185-305 (IEC 62305)

## Vario quick connector

A2

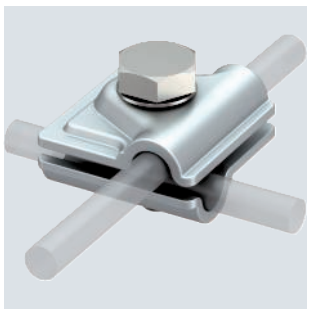


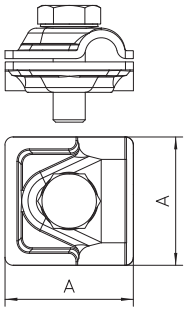

| Type | Fit mm | Dim. A mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **249 8-10 VA** | Rd 8-10 | 40 | H/100 | 10 | **5311551** |

- For T, cross and parallel connectors
- Quick installation using hexagonal bolt M10 x 30, high-grade stainless steel
- Conforms to the requirements according to DIN VDE 0185-305 (IEC 62305)

## Vario quick connector

Alu






| Type | Fit mm | Dim. A mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **249 8-10 ALU** | Rd 8-10 | 44 | H/100 | 30 | **5311519** |

- For T, cross and parallel connectors
- Quick installation using hexagonal bolt M10 x 30, high-grade stainless steel
- Conforms to the requirements according to DIN VDE 0185-305 (IEC 62305)



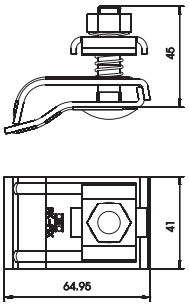
Always indicate the item number when ordering.

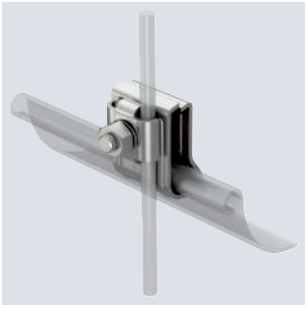
A2

## Gutter clamp RK-FIX

| Type | Fit mm | Lightning current carrying capacity kA | Material | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **RK-FIX VA** | 2 x Rd 8/ 2 x Rd 6 | H/100 | A2 | 10 | | **5316459** |

- For up to 2 round conductors Rd 6 or Rd 8
- Suitable for all bead thicknesses (15–25 mm)
- With 1 truss-head bolt M10 x 45
- With spring for prefixing on rain gutter
- Clamp body and crossbar made of rustproof stainless steel (V2A)
- Nut, bolt and spring made of stainless steel (V2A)
- Tested to VDE 0185-561-1 (IEC/EN 62561-1)



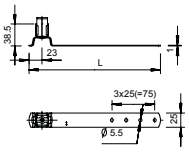



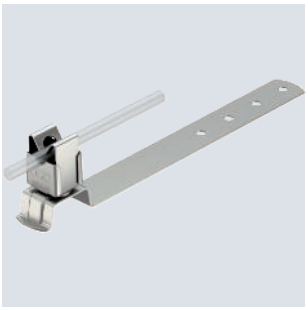
A2

## Roof conductor holder for tiled roofs, Rd 8

| Type | Fit mm | Installation height mm | Length mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **157 F-VA 280** | Rd 8 | 38.5 | 280 | 20 | | **5215579** |

- Conductor holder from stainless steel (V2A)
- Including drill hole in bottom section for quick installation



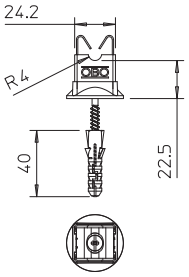



A2

## Cable bracket for Rd 8 mm, fastening with screw and anchor

| Type | Fit mm | Installation height mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **177 20 VA B-HD** | Rd 8 | 20 | 50 | | **5207901** |

- With female thread M8 or through hole Ø 5 mm
- From stainless steel (V2A)
- With pre-mounted wood screws (5 x 60) and plastic dowels (8 x 40)

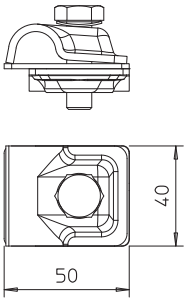


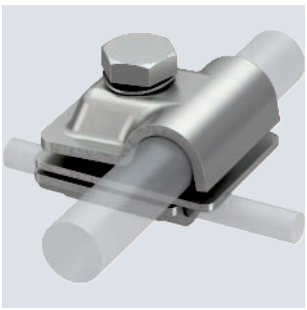

A2

## Vario quick connector Rd 8-10x16

| Type | Fit mm | Dim. A mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **249 8-10X16 VA** | 8-10x16 | 40 | H/100 | 10 | | **5311590** |

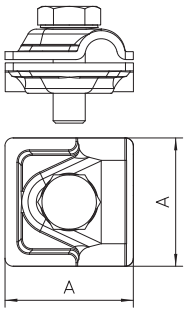
- For T, cross-over and parallel connections with adapter plates
- Quick mounting using an M10 x 30 bolt, made from rustproof stainless steel
- With sprung washer to DIN 137
- Corresponds to the requirements of VDE 0185-305 (IEC 62305)



## Vario quick connector

A2

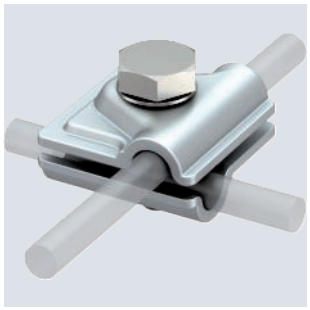


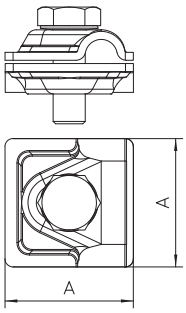

| Type | Fit mm | Dim. A mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **249 8-10 VA** | Rd 8-10 | 40 | H/100 | 10 | | **5311551** |

- For T, cross and parallel connectors
- Quick installation using hexagonal bolt M10 x 30, high-grade stainless steel
- Conforms to the requirements according to DIN VDE 0185-305 (IEC 62305)

## Vario quick connector

Alu



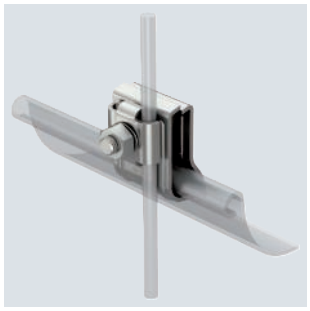


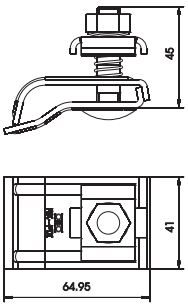

| Type | Fit mm | Dim. A mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **249 8-10 ALU** | Rd 8-10 | 44 | H/100 | 30 | | **5311519** |

- For T, cross and parallel connectors
- Quick installation using hexagonal bolt M10 x 30, high-grade stainless steel
- Conforms to the requirements according to DIN VDE 0185-305 (IEC 62305)

## Gutter clamp RK-FIX

A2



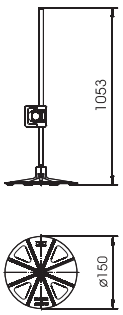



| Type | Fit mm | Lightning current carrying capacity kA | Material | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **RK-FIX VA** | 2 x Rd 8/ 2 x Rd 6 | H/100 | A2 | 10 | | **5316459** |

- For up to 2 round conductors Rd 6 or Rd 8
- Suitable for all bead thicknesses (15–25 mm)
- With 1 truss-head bolt M10 x 45
- With spring for prefixing on rain gutter
- Clamp body and crossbar made of rustproof stainless steel (V2A)
- Nut, bolt and spring made of stainless steel (V2A)
- Tested to VDE 0185-561-1 (IEC/EN 62561-1)

## Stand for FangFix Junior system

Alu




| Type | Length mm | Nominal size Ø mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **F-FIX-JUNIOR** | 1000 | 10 | 10 | | **5403308** |

- Incl. aluminium air-termination rod 1,000 mm long (Ø 10 mm)
- Quick mounting of the air-termination rod in the base using plug technology
- With Vario quick connector 249

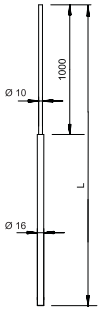


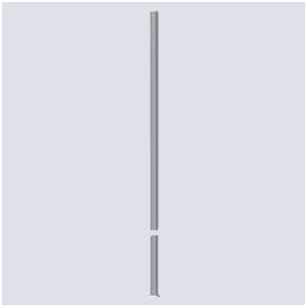
Always indicate the item number when ordering.

Alu

## Tapered pipe air-termination rod

| Type | Length mm | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **101 VL1500** | 1500 | 10/16 | 1 | **5401980** |
| **101 VL2000** | 2000 | 10/16 | 1 | **5401983** |
| **101 VL3000** | 3000 | 10/16 | 1 | **5401989** |



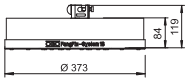



- Suitable for wind loads according to Eurocode 1: DIN EN 1991-1-4
- From a free length of > 2.5 m, an additional fastening, e.g. insulated spacer is recommended
- Last metre is tapered from Ø 16 mm to Ø 10 mm, material: AlMgSi
- Matches stand system FangFix

BET

## Stand for FangFix system, min. 16 kg

| Type | Fit mm | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **F-FIX-16** | Rd 8 | 373 | 1 | **5403200** |

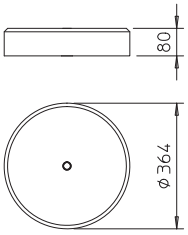



- System consisting of FangFix block with edge protection and clamp
- FangFix clamp made of VA; complies with the requirements of VDE 0185-305 (IEC 62305)
- Min. 16 kg block of Ø 365 mm, high level of stability
- Quick and easy installation of air-termination rod using anchors
- Frost-resistant concrete
- The FangFix block can be stacked
- Suitable for Ø 16 mm pipe air-termination rods

BET

## Concrete base for FangFix system, min. 16 kg

| Type | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **F-FIX-S16** | 365 | 1 | **5403227** |

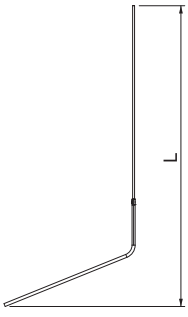


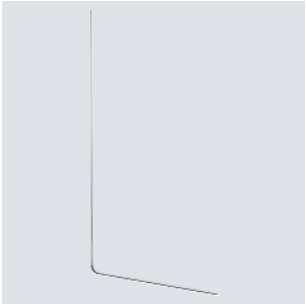

- Min. 16 kg block of Ø 365 mm, high level of stability
- Frost-resistant concrete
- Stackable

Alu

## Angled air-termination rod for PV frames

| Type | Length mm | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **101 VL2000 112** | 2000 | 10/16 | 10 | **5401950** |

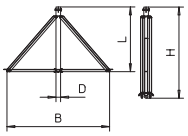


- Suitable for wind loads according to Eurocode 1: DIN EN 1991-1-4
- Last metre is tapered from Ø 16 mm to Ø 10 mm, material: AlMgSi
- Angled to 112°

## isFang tripod

A2 Alu

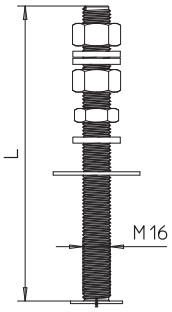



| Type | Dim. B mm | Dim. D Ø mm | Dim. L mm | Dim. H mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|
| **isFang 3B-150 AL** | 1500 | 40 | 900 | 1275 | 1 | **5408967** |
| **isFang 3B-100** | 1000 | 40 | 600 | 885 | 1 | **5408968** |

- Installation of free-standing air-termination rods as well as insulated air-termination rods with 40 mm diameter
- Roof slope to max. 5 degrees
- Incl. Rd 8–10 crossbar for quick round conductor fastening
- Concrete base as well as threaded rods should be ordered separately

## isFang-3B threaded rod

A2

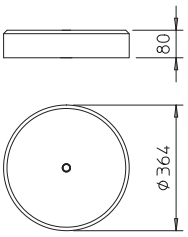



| Type | Dim. L mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **isFang 3B-G2** | 340 | 3 | **5408972** |
| **isFang 3B-G3** | 430 | 3 | **5408973** |

- For fastening on one, two, three or four FangFix concrete bases with tripod stand

## Concrete base for FangFix system, min. 16 kg

BET

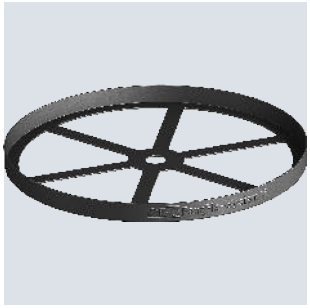


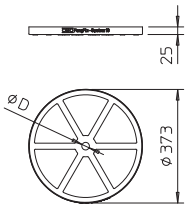

| Type | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **F-FIX-S16** | 365 | 1 | **5403227** |

- Min. 16 kg block of Ø 365 mm, high level of stability
- Frost-resistant concrete
- Stackable

## Base for FangFix system 16 kg for mounting the isFang tripod

PP






| Type | Nominal size Ø mm | Dim. D Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **F-FIX-B16 3B** | 373 | 25 | 10 | **5403238** |

- Edge protection with through hole
- For mounting isFang-3B threaded rod and FangFix concrete block F-FIX-S16



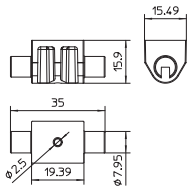
Always indicate the item number when ordering.

PP

## Universal flat conductor adapter for roof conductor holder, type 165/MBG

| Type | Colour | Fit mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| 165 MBG UH | Black | Rd 8 | 25 | 5218882 |

- Universal adapter with drill hole Ø 2.5 mm
- E.g. for OBO Golden Sprint screw, type 4758 4 x L (L = depending on application)
- For fastening to 165/MBG

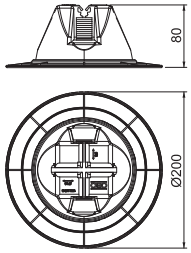



PP/ PE

## Roof conductor holder for flat roofs, with increased base section

| Type | Fit mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| 165 MBG-8-10 200 | Rd 8-10 | 4 | 5218716 |

- Closed form with base
- With double conductor holder
- Filling weight 1 kg (frost-resistant concrete)
- Sleeve from polyethylene, black, UV-resistant and weatherproof
- Base made of polypropylene, black, UV-resistant and weather-resistant
- With larger base section (Ø 200 mm) for better stability

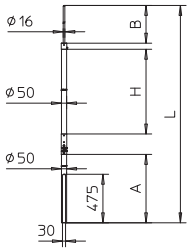



GFK

## Insulated air-termination rod for inner-routed isCon conductor with side exit

| Type | Dim. D Ø mm | Dim. A mm | Dim. H mm | Dim. B mm | Length mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| isFang IN-A 4000 | 50 | 1325 | 1500 | 1000 | 4000 | 1 | 5408938 |
| isFang IN-A 6000 | 50 | 3325 | 1500 | 1000 | 6000 | 1 | 5408940 |

- For installation of the OBO isCon® Pro+ conductor in the pipe
- With side conductor outlet matching isFang air-termination rod stand with side outlet, type isFang 3B-A
- Suitable for wind loads according to Eurocode 1: DIN EN 1991-1-4
- Inclusive connection element (type isCon IN connect)
- Inclusive potential connection (type isCon In PAE)
- Aluminium standpipe and air-termination tip
- Centre section made of fibre-glass reinforced plastic (GRP)

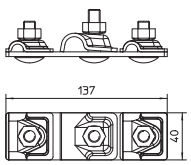


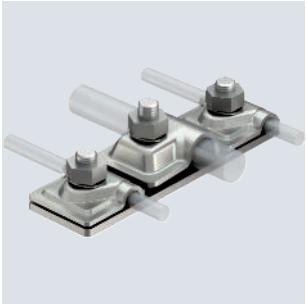

A2

## Connection plate for two isCon® conductors

| Type | Dimension | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| isCon AP2-16 VA | 16x8-10mm | 1 | 5408028 |
| isCon AP1-16 VA | 16x8-10mm | 1 | 5408026 |

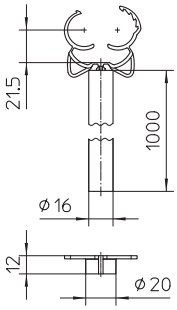
Connection plate to connect two isCon® conductors with air-termination rod Ø 16 mm, tested up to 150 kA (lightning protection class II)



## Spacer

GFK

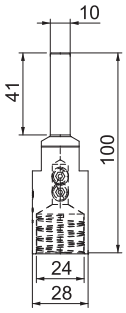



| Type | Clamping range D mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **isCon DH** | 23-26 | 2 | | **5408043** |

For stand-off installation of the isCon® conductor in the area of the connection, incl. reducing sleeve for mounting on FangFix concrete block 10 Kg.

## isCon® connection element

A2

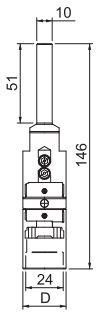



| Type | Dim. D Ø mm | Fit mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **isCon connect** | 28 | 23 | H1/150 | 2 | | **5408022** |

- Screw-on termination of the connection for the isCon® conductor
- Incl. heat-shrinkable sleeve, hexagonal
- Tested up to 200 kA (lightning protection class I)

## isCon® connection element set ASE, testable

A2



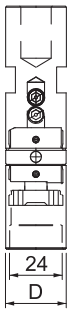

| Type | Dim. D Ø mm | Fit mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **isCon ASE 23** | 28 | 23 | 1 | | **5408080** |

- For the isCon® Pro+ and Premium conductor
- Set consisting of 2 testable connection elements
- For function and state determination with integrated ASE technology (Adaptive Switching Element)
- For comprehensive repeat testing according to VDE 0185-305-3 (IEC/EN 62305-3)
- Screw-on termination
- Testable with the simplest insulation measuring devices (≥ 1 kV DC)
- Can be used in all lightning protection classes
- For highest system availability - no switch-off, dismantling or testing with dangerous pulse voltages
- QR code to open the test report
- Incl. heat-shrinkable hose and Allen key

A2

## isCon® connection elements set ASE, testable for isFang IN

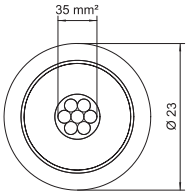
| Type | Dim. D Ø mm | Fit mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **isCon ASE 23 IN** | 28 | 23 | 1 | | **5408082** |

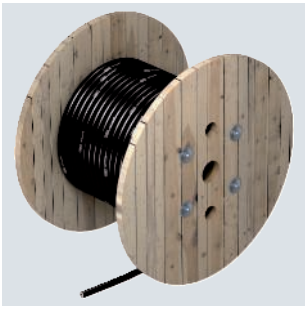



- For the isCon® Pro+ and Premium conductor
- Set consisting of 2 testable connection elements
- Connection and routing of the cable in the insulated air-termination mast
- For function and state determination with integrated ASE technology (Adaptive Switching Element)
- For comprehensive repeat testing according to VDE 0185-305-3 (IEC/EN 62305-3)
- Screw-on termination
- Testable with the simplest insulation measuring devices (≥ 1 kV DC)
- Can be used in all lightning protection classes
- For highest system availability - no switch-off, dismantling or testing with dangerous pulse voltages
- QR code to open the test report
- Incl. heat-shrinkable hose and Allen key

## isCon® conductor, Professional plus black

| Type | Cross-section mm² | Nominal size Ø mm | Equivalent separation distance m | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|---|
| **isCon Pro+ 75 SW** | 35 | 23 | 0.75 | 25 | | **5408002** |
| **isCon Pro+ 75 SW** | 35 | 23 | 0.75 | 100 | | **5408004** |
| **isCon Pro+ 75 SW** | 35 | 23 | 0.75 | 250 | | **5408006** |



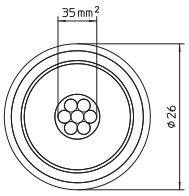



Please refer to the mounting instructions for information on routing the OBO isCon® conductor.

- Highly voltage-resistant, insulated conductor
- Floating discharge-free
- Additional mechanical protection (black protective jacket)
- For maintenance of the separation distance according to IEC 62305 (VDE 0185-305-3)
- Tested according to IEC/EN 62561-1 (VDE 0185-561-1) with H1/150 kA
- Equivalent separation distance se ≤ 0.75 m (air) and se ≤ 1.5 (solid material)
- Tested according to IEC TS 62561-8 (VDE V 0185-561-8)
- Halogen-free
- Fire load 4.3 kWh/m
- Can be used in potentially explosive areas Ex zone 1/2 and 21/22 when taking the current mounting instructions into account

## isCon® conductor, Professional plus light grey

| Type | Cross-section mm² | Nominal size Ø mm | Equivalent separation distance m | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|---|
| **isCon Pro+ 75 GR** | 35 | 26 | 0.75 | 25 | | **5407995** |
| **isCon Pro+ 75 GR** | 35 | 26 | 0.75 | 100 | | **5407997** |

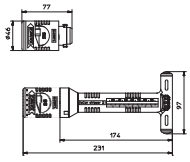



Please refer to the mounting instructions for information on routing the OBO isCon® conductor.

- Highly voltage-resistant, insulated conductor
- Protection against contact voltage during rain (VDE 0432-1 (IEC/EN 60060-1)
- Floating discharge-free
- Additional mechanical protection (double protective jacket)
- For maintenance of the separation distance according to IEC 62305 (VDE 0185-305-3)
- Tested according to IEC/EN 62561-1 (VDE 0185-561-1) with H1/150 kA
- Equivalent separation distance se ≤ 0.75 m (air) and se ≤ 1.5 (solid material)
- Tested according to IEC TS 62561-8 (VDE V 0185-561-8)
- Halogen-free
- Fire load 5.1 kWh/m
- Protection against contact voltage under sprinkling (VDE 0432-1 (IEC/EN 60060-1)
- Can be used in potentially explosive areas Ex zone 1/2 and 21/22 when taking the current mounting instructions into account

## Stripping tool for isCon® conductor

PA/PE




| Type | Clamping range D mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **isCon stripper 2** | 20-23 | 1 | | **5408013** |

Stripping tool to remove the insulation of the OBO isCon® conductor.

## isCon® information panel

PS

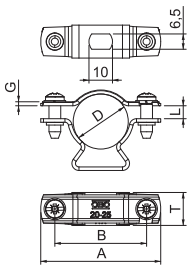


| Type | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|
| **isCon HWS** | 1 | | **5408058** |

Label: "NOTE! Insulated lightning protection with the OBO isCon® system. Only a lightning protection specialist may carry out changes"
- To label the lightning protection system
- Self-adhesive and with 4 fastening holes ø 6.5 mm

## VA cable bracket for isCon® conductor for mounting on roof/wall structures

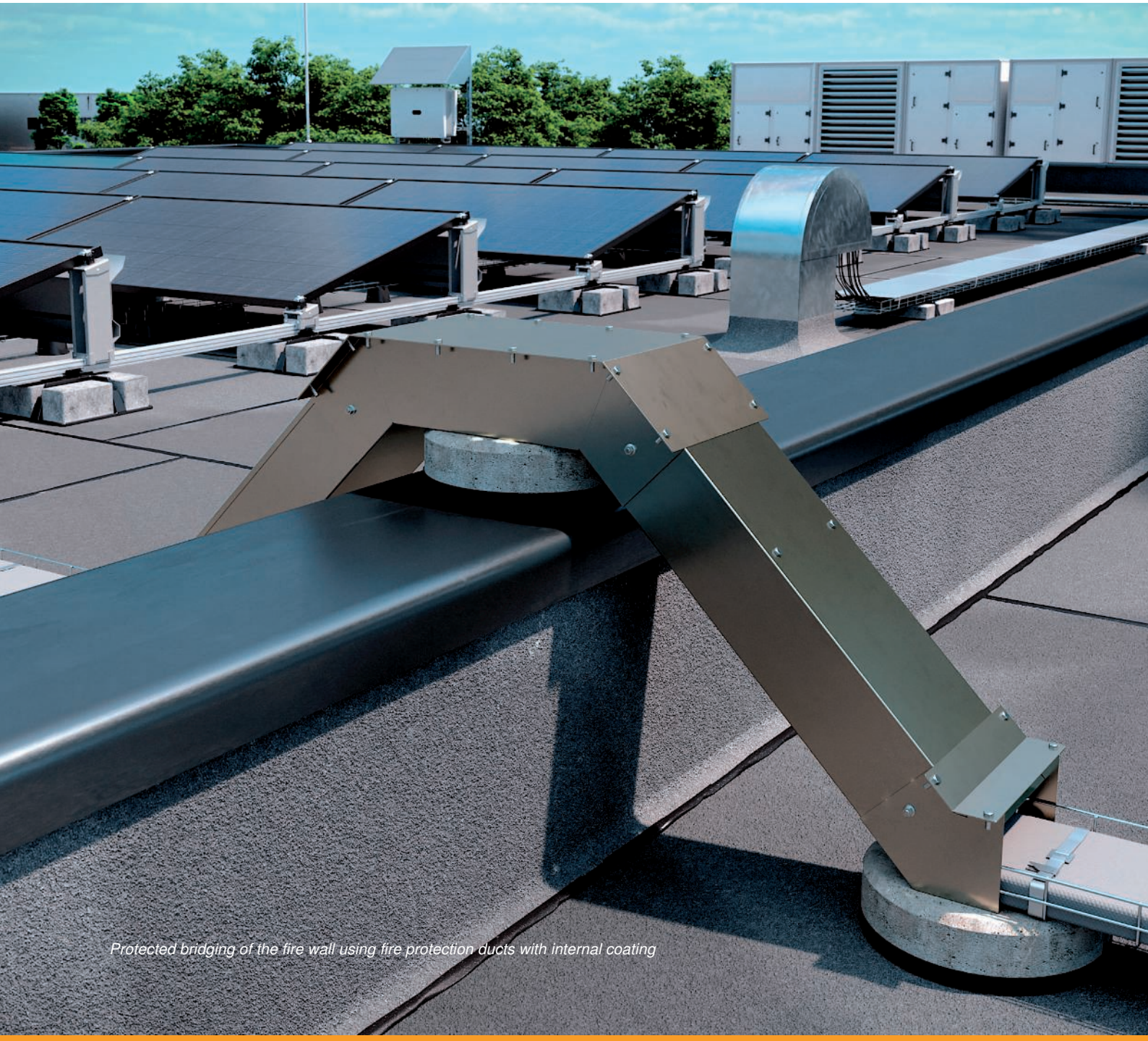
A2




| Type | Dim. D Ø mm | Dim. A mm | Dim. B mm | Dim. L mm | Dim. T mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|---|
| **isCon H VA** | 23 | 51 | 39 | 2.5 | 14 | 50 | | **5408056** |

- For isCon® conductor for mounting on roof/wall structures
- With sprung discs to protect the screws against loosening

# Construction fire protection for outdoor applications



*Protected bridging of the fire wall using fire protection ducts with internal coating*

## Cable routing over firewalls

Combustible cables may not be run over firewalls without fire protection measures. In the event of a fire, they would spread the fire to the neighbouring roof area.

Two solutions are available to bridge fire walls in a protected manner, thus preventing fire from spreading:

- Routing of the PV cables in extremely robust PYROLINE® PLMR stainless steel ducts
- Wrapping of the cable bundles with the flexible, weatherproof PYROWRAP® Wet FSB-WB cable bandage

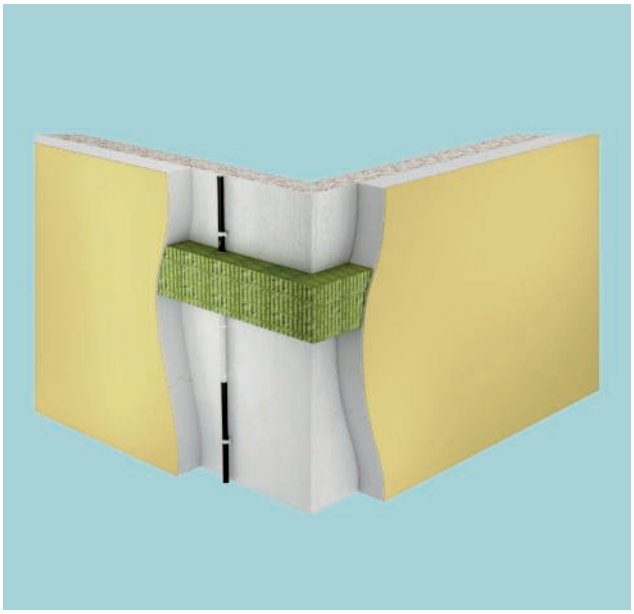
When there is a fire, the substances forming an insulation layer, which are contained in both solutions, foam up and prevent the spread of fire via the PV cables.

Alternatively, this solution can be used on the insulated isCon® lightning protection conductor.

*Fire protection bandage to prevent fire from spreading*

## Insulated lightning protection under external thermal insulation composite systems (ETICS)

If isCon® cables are routed within an external thermal insulation composite system (ETICS), then they may penetrate fire locks made of non-combustible substances. If there is a fire, the fire locks may even fail. Here, the PYROWRAP® Wet FSB-WB cable bandage is again used, which prevents the fire from spreading. Whilst the insulation burns and openings are created, the insulation layer creator foams them up again. This safely prevents a chimney effect via the isCon® conductor.



*Fire protection bandage to prevent fire from spreading via isCon® in external thermal insulation composite systems (ETICS)*

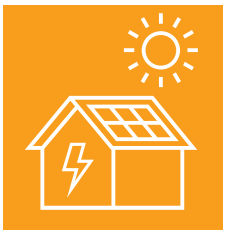
# Construction fire protection

In some cases, the cables carrying direct current must still be routed through the building up to the inverter. If the installations are in rescue routes, then the PV DC cables must either be routed out of reach or in encapsulated form. The OBO PYROLINE® Sun PV fire protection ducts are suitable for this. They are made of non-conductive lightweight concrete and fulfil the construction requirements as installation ducts with proven fire protection. In addition, the fire protection duct fulfils the requirements of the application rule VDE-AR-E 2100-712 for fireproof and contact-proof installations (Sections 6.2 and 6.4). This also offers additional protection for the rescue services against electric shocks during extinguishing work.

If installations are routed through fire-resistant ceilings or walls in the building, the openings have to be sealed with permitted insulations to prevent the fire from spreading. One suitable solution is fire protection foam PYROSIT® NG in combination with foam blocks PYROPLUG® Block.

## Protection through organisational measures

At the transition point of the electrical system, e.g. house connection box and main distribution, VDE 0100-712 and VDE-AR-E 2100-712 require the attachment of the standardised information sign / fire brigade sign. The fire brigade can recognise the PV system through the identification and fireproof routing of the energised DC cables.



## Construction regulations

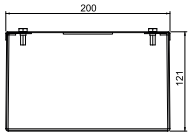
- EN 13501-1/-2, DIN 4102-1/-2 Fire classification of construction products and building elements

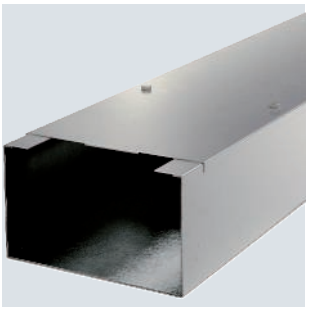
*The national and regional construction regulations must be observed with regard to the use of construction products. These include, for example, the state construction regulations in Germany, VKF regulations in Switzerland and OIB directives in Austria.*

A2 BK

## Metal installation duct PLMR for outdoor applications

| Type | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|
| **PLMR 1220 A2** | 2000 | 2 | **7218200** |



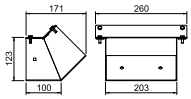



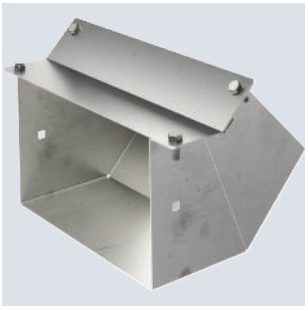
Installation duct made from metal with intumescent fire protection mesh. Prevents the spread of fire and protects against the impacts of cable fires. Fire resistance of up to 90 minutes. With matching fittings, obstacles in outdoor areas can be overcome easily. Suitable for the mounting on FangFix concrete block. Can be used as a special solution when laying cables over firewalls, according to expert opinion. Solution according to EltAnlagen 2020 of BMI +AMEV. Only certified pre-terminated fittings may be used. Screws included for fastening the duct cover. When used with photovoltaic cables over firewalls, this may need to be coordinated with the relevant authorities.

A2 BK

## Rising level, for installation duct PLMR

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **PLMR LR 1220 A2** | 171 | 260 | 158 | 1 | **7218202** |



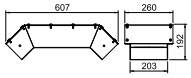



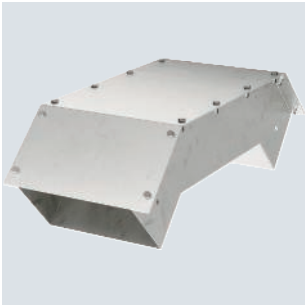
Level, rising version. Suitable for the installation duct PLMR. To overcome obstacles in outdoor areas. Screws and nuts included.

A2 BK

## Metal installation duct PLMR for outdoor applications

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **PLMR LFD** | 607 | 260 | 187 | 1 | **7218204** |



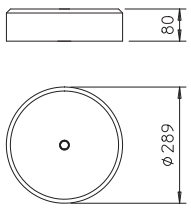



Level, rising version. Suitable for the installation duct PLMR. To overcome obstacles in outdoor areas. Screws and nuts included.

BET

## Concrete base for FangFix system, min. 10 kg

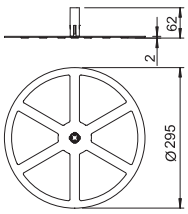
| Type | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **F-FIX-S10** | 289 | 1 | **5403117** |




- Min. 10 kg block of Ø 289 mm, high level of stability
- Frost-resistant concrete
- Stackable

## Base for FangFix system 10 kg

PP

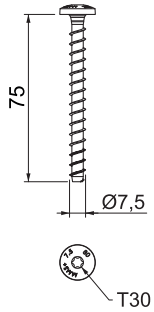



| Type | Nominal size Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **F-FIX-B10** | 295 | 10 | **5403124** |

Edge protection with integrated dowel (basic) suitable for FangFix 10 kg system.

## MMS-plus P round head tie, with pan head, made of A4 stainless steel

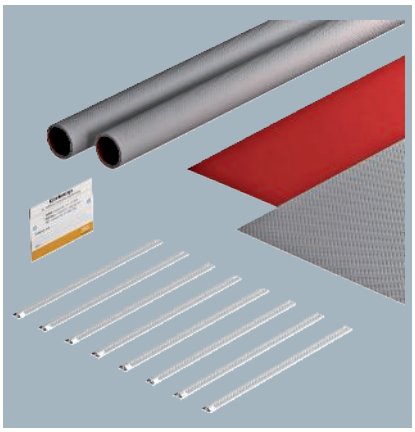
A4




| Type | Dimension mm | Drill hole Ø mm | Head Ø mm | Screw system | Length mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **MMS+ P 7.5x75 A4** | 7,5x75 | 6 | 14.5 | Torx | 75 | 50 | **3498274** |

Stainless steel screw-in anchor for direct mounting without additional anchors in cracked and uncracked concrete and masonry. With round head for universal fastenings in wet rooms and outdoor areas. Torx drive T30.
Construction product tested according to EAD and CE mark, with European Technical Assessment (ETA) and proof of suitability. Load-bearing capacities under fire loads proven up to fire resistance class R120.

## Bandage set for outdoor applications



| Type | Length mm | Width mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **FSB-K32** | 550 | 380 | 1 | **7203150** |
| **FSB-K82** | 550 | 880 | 1 | **7203154** |

Complete set for covering cable bundles or cable support systems without cover to prevent a fire spreading. Application in outdoor areas. Each of the sets contains 4 sections of the weather-resistant cable bandage PYROWRAP® Wet, 8 metal strip clips and an identification plate. Sufficient for approx. 2 m length.
Dimension data: Sections of the FSB-WB bandage

Scope of the surrounding cable support systems:
FSB-K32 maximum 320 mm
FSB-K82 maximum 820 mm
(including min. 5 cm bandage overlap)

Use with photovoltaic cables over firewalls may require the approval of the local construction authorities. A positive special report is available.



Always indicate the item number when ordering.

## PYROSIT® NG 2-component fire protection foam

| Type | Contents ml | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **FBS-S** | 380 | 1 | **7203800** |

PYROSIT® NG 2-component fire protection foam in a cartridge, including 2 mixing tubes. To create cable and combination insulation in interior areas; always process the coaxial cartridge 5:1 with FBS-PH or FBS-PA cartridge pistols.
In dry, frost-free rooms, the cartridge can be stored closed and standing upright at temperatures from +5 °C to +30 °C for up to 12 months.

Processing of products containing diisocyanate is subject to training in accordance with REACH ordinance (EG) 1907/2006, as amended by Regulation (EU) 2020/1149 of 4.8.2020. The training can be carried out online. Information on this can be found in the technical info under downloads on the product.

## Mixer pipe set

| Type | Min. ordering quantity PU | Item no. |
|---|---|---|
| **FBS-M** | 1 | **7203803** |

10 mixing tubes and 5 extension tubes in a set for PYROSIT® NG fire protection foam. Must be used with the 5:1 coaxial cartridge.

St

## Professional cartridge pistol

| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **FBS-PH** | 1 | **7203806** |

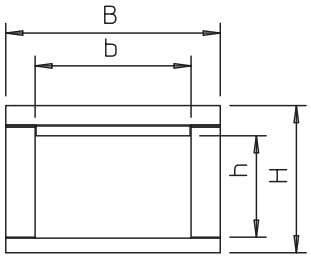
High-quality 2-component cartridge pistol for use with the PYROSIT® NG fire protection foam. The action of the trigger parallel to the handle ensures easy working. Suitable for 5:1 coaxial cartridges. Free the moving parts, push rods and pressure plate from any foam residues and maintain them with a re-greasing cleaning agent.

## PYROLINE® Sun PV I30 fire protection duct

| Type | Length mm | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|
| **BSKP03-K0406** | 1000 | 1 | | **7214701** |

Fire protection duct made from water and frost-proof fibreglass lightweight concrete of building material class A1 according to EN 13501-1 for fireproof laying of photovoltaic cables inside and outside of buildings. The requirements of accidental contact protection for emergency forces are met. Classification I30 as I duct according to DIN 4102 Part 11 for the protection of rescue and emergency routes.
Mounting of the duct directly on walls or under ceilings and on support systems.
Including countersunk head screws and sealing strip.

**Dimensions**




| Type | Dim. h mm | Dim. b mm | Dim. H mm | Dim. B mm |
|---|---|---|---|---|
| BSKP03-K0406 | 40 | 60 | 85 | 100 |

## Identification plate

PVC


| Type | Language | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **KS-BSKP DE** | German | 1 | | **7214725** |

Information panel to label the fire protection duct as a photovoltaic duct according to the VDE application rule. Including two push-fit anchors.

## Fire protection case


| Type | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|
| **FBS-K** | 1 | | **7203809** |

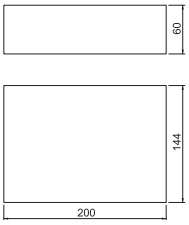
The PYROSIT® NG fire protection case contains all the required products to create foam insulations. The complete set contains 3 foam cartridges, 1 professional cartridge pistol, 6 mixing and 5 extension pipes. For interior application.



Always indicate the item number when ordering.

## PYROPLUG® Block foam block

| Type | Dimension mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **FBA-B200-14** | 200x144x60 | 4 | | **7202505** |

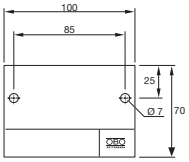



Soft, permanently elastic foam block for cable and combination insulation. Vertical and transverse installation to achieve different fire resistance classes. Can be combined with the two-component fire protection foam PYROSIT® NG. Can be used in solid ceilings and walls and in light-duty partitions and is approved for many installations. For interior application. CE-labelled construction product according to ETA-15/0803 for applications with fire resistance periods of up to 120 minutes.
Details on the applications can be found in the approval documents.
Protect the surface of the foam insulation against water in order to guarantee safe expansion in the event of fire. Coating with standard silicone is approved.

PS

## Identification plate

| Type | Language | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **KS-S DE** | German | 1 | | **7205425** |





Identification plate to be written on with waterproof and light-resistant felt-tip pen for fire-safe cable glands, including 2 push-fit anchors.

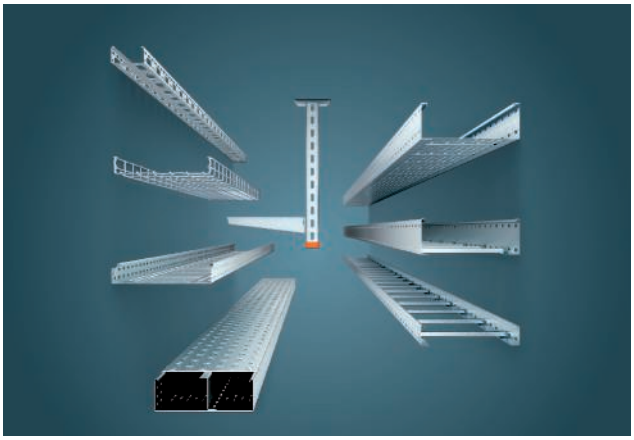
# Cable management outdoors

## Solid connections, easy installation

Cables outside the building are particularly exposed to the weather. Rain, snow, heat, UV radiation and wind continually attack the PV system. OBO cable support systems combine the best possible protection with rapid mounting. Our product range comprises closed cable tray systems, wide span tray and mesh cable tray systems, and cable ladders. Using clever details, such as the mounting adapter, you can fix mesh cable trays to the OBO FangFix concrete blocks and the OBO UniBase system in a single action. Wind load securing is optional and can be implemented using OBO tightening straps. This must be tailored to the specific project as it varies, for example, depending on the local wind load.

## Cable support systems: quickly mounted and safe

- Cable trays
- Mesh cable trays
- Cable ladders
- Vertical ladders
- Suspended supports
- Wall and support bracket

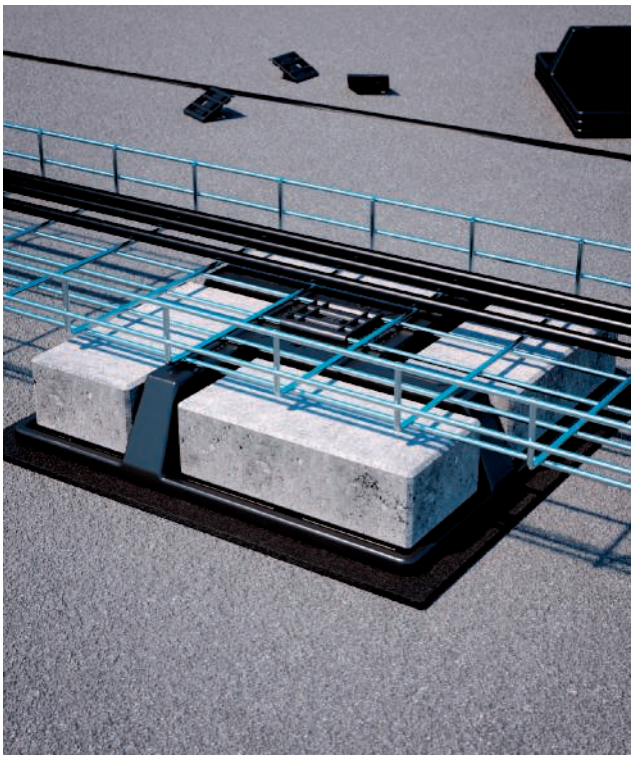


## Shielding of cables

The passive shielding of cables with OBO cable support systems with covers permits attenuation of up to 60 dB. This means that electronic system components are protected against electromagnetic interference, and economic losses through failure or damage are prevented.

## Area shielding

Direct and local lightning strikes create a magnetic field which causes induced currents in electrical and electronic systems. Professional cable routing with the OBO TrayFix systems or the OBO UniBase system can, under certain conditions according to VDE 0185-305-4 (IEC / EN 62305-4), reduce the necessary surge protection measures. The same applies to optimised cable shielding, for example with EMC-tested cable support systems from OBO.



## Strain relief for vertical cable routing

When cables are routed vertically, appropriate strain relief must be ensured. Our product range comprises vertical ladder systems with various profiles for direct wall mounting, for free-standing mounting or mounting on existing steel structures.

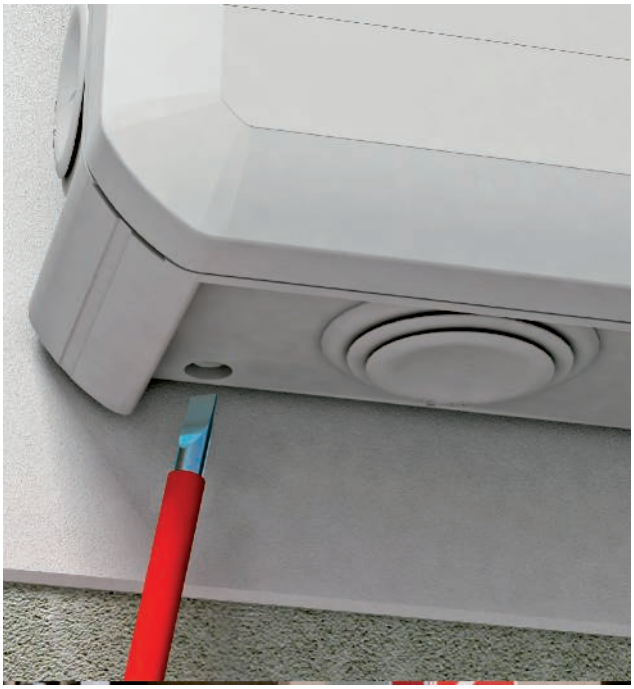
## Perfect protection in buildings

Even in buildings, cables are subject to mechanical loads, which, in the worst-case scenario, can lead to the failure of the system. Combination of the OBO products creates reliable protection of cabling, from the roof through to the inverter. Wall and ceiling ducts of different dimensions are complemented with appropriate fittings. Plastic and metal cable and pipe fastening systems and clips protect small cable volumes and individual cables. In this way, you can protect the system against failure through torn or worn-through cables for decades to come.

## For tidy cable routing in buildings

- Wall and ceiling duct
- Cable and pipe fastening systems made of plastic and metal
- Screw-in and knock-in systems
- Rail systems

*Metal pipe systems: The first choice for protection under tough conditions*



*Pre-marked openings to minimise condensation caused by temperature variations*

## Precautions for water removal

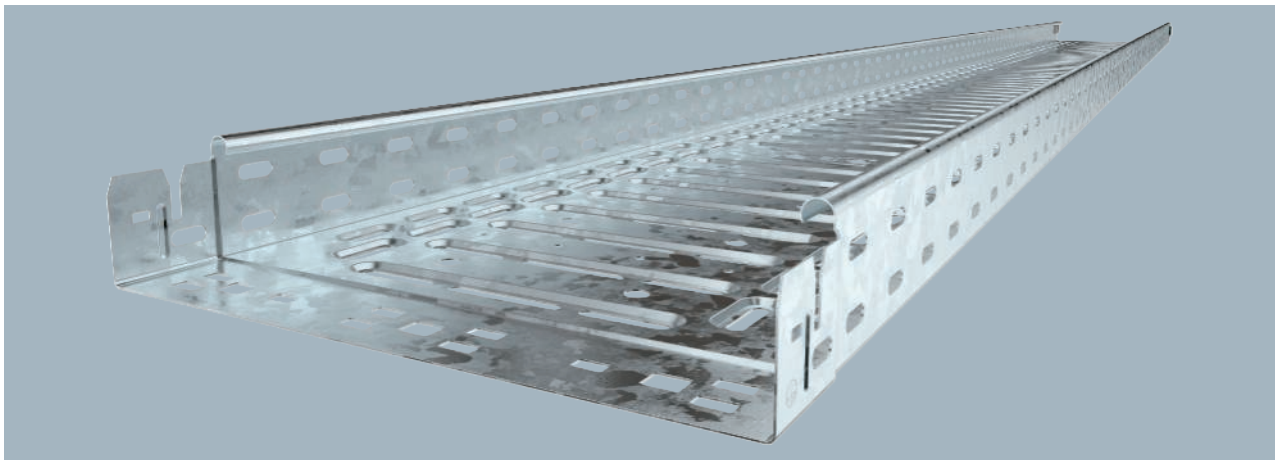
Laut DIN VDE 0100-520 (Errichten von Starkstromanlagen – Nennspannungen bis 1,000 V) „müssen Vorkehrungen für die Wasserabführung getroffen werden, wenn Wasser oder Kondensation von Wasser innerhalb von Kabel- oder Leitungssystemen auftreten kann.“

## Protection against sunlight and high temperatures

Strong UV radiation can cause damage and destruction to plastics. Electrical devices generate heat through power loss. In conjunction with high ambient temperatures and direct sunlight, the internal temperature can increase. Based on the local loads, the installation engineer may need to perform additional measures. For example, the installation must be protected by an additional roof against direct sunlight and loads from rain and snow.

## Cable tray RKS-Magic® 60

St FT

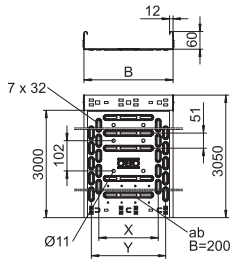


| Type | Width mm | Metal thickness mm | BS | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| **RKSM 610 FT** | 100 | 1.00 | | 3 | **6047612** |
| **RKSM 620 FT** | 200 | 1.00 | | 3 | **6047639** |
| **RKSM 630 FT** | 300 | 1.00 | | 3 | **6047655** |
| **RKSM 640 FT** | 400 | 1.00 | | 3 | **6047690** |
| **RKSM 650 FT** | 500 | 1.00 | | 3 | **6047720** |
| **RKSM 660 FT** | 600 | 1.00 | | 3 | **6047736** |

Cable tray with integrated quick fastening system. The usable length of the cable tray is 3,000 mm.
The cable tray has continuous side perforations of 7 x 20 mm for the installation of additional connection and mounting components.
The perforation for direct threaded rod suspension has a diameter of 11 mm.

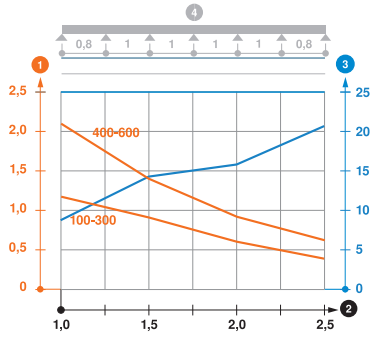
| Type | Length mm | Dim. B mm | Usable cross-section cm² | Dim. x mm | Dimension y mm |
|---|---|---|---|---|---|
| RKSM 610 FT | 3050 | 100 | 58 | – | 50 |
| RKSM 620 FT | 3050 | 200 | 118 | 100 | 150 |
| RKSM 630 FT | 3050 | 300 | 178 | 200 | 250 |
| RKSM 640 FT | 3050 | 400 | 238 | 300 | 350 |
| RKSM 650 FT | 3050 | 500 | 298 | 400 | 450 |
| RKSM 660 FT | 3050 | 600 | 358 | 450 | 550 |

### Dimensions




| | 1.0 m kN/m | 1.5 m kN/m | 2.0 m kN/m | 2.5 m kN/m | NEMA load class |
|---|---|---|---|---|---|
| **RKSM 610 FT** | 1.2 | 0.9 | 0.6 | 0.4 | 8AA |
| **RKSM 620 FT** | 1.2 | 0.9 | 0.6 | 0.4 | 8AA |
| **RKSM 630 FT** | 1.2 | 0.9 | 0.6 | 0.4 | 8AA |
| **RKSM 640 FT** | 2.1 | 1.35 | 0.9 | 0.6 | 8AA |
| **RKSM 650 FT** | 2.1 | 1.35 | 0.9 | 0.6 | 8AA |
| **RKSM 660 FT** | 2.1 | 1.35 | 0.9 | 0.6 | 8AA |

### Load




**Load diagram, cable tray, type RKSM 60**

1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm

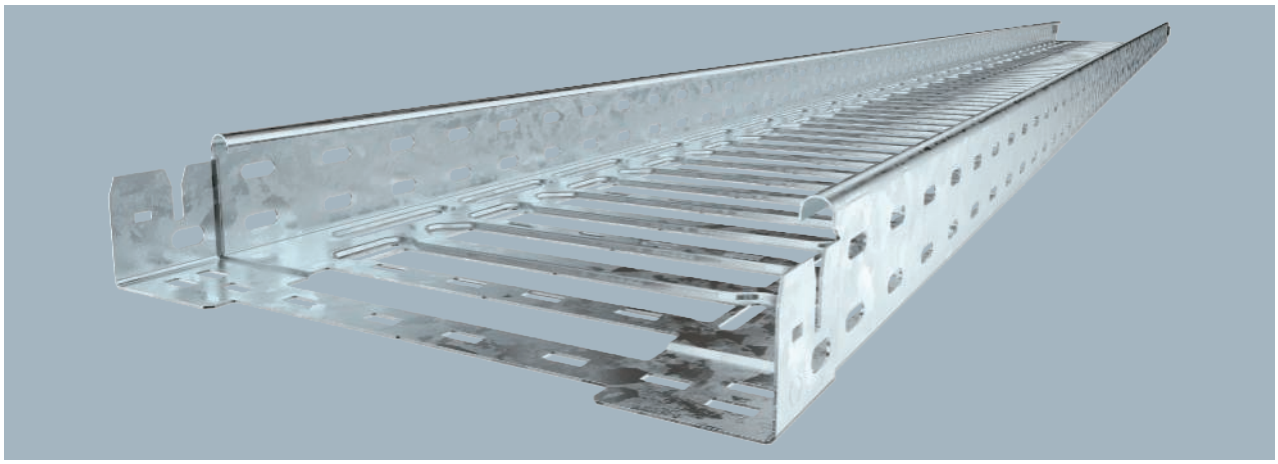
— Strut bend curve according to support width



Always indicate the item number when ordering.

St FT

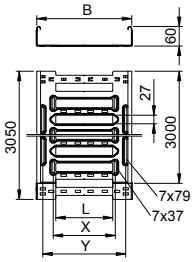
# Cable tray MKS-Magic® 60



Cable tray with integrated quick fastening system. The usable length of the cable tray is 3,000 mm.
The cable tray has continuous side perforations of 7 x 20 mm for the installation of additional connection and mounting components.
From a cable tray width of 200 mm with 30% hole surface, suitable for use under sprinkler systems according to VdS guideline 2092.

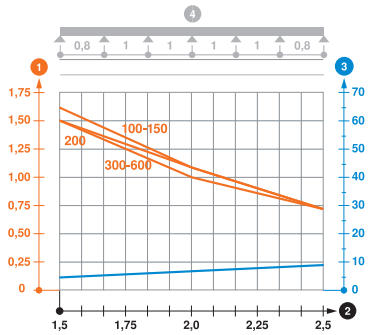
| Type | Width mm | Metal thickness mm | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|
| **MKSM 610 FT** | 100 | 1.00 | 3 | | **6059018** |
| **MKSM 620 FT** | 200 | 1.00 | 3 | | **6059022** |
| **MKSM 630 FT** | 300 | 1.00 | 3 | | **6059025** |
| **MKSM 640 FT** | 400 | 1.00 | 3 | | **6059027** |
| **MKSM 650 FT** | 500 | 1.00 | 3 | | **6059029** |
| **MKSM 660 FT** | 600 | 1.00 | 3 | | **6059032** |

## Dimensions




| Type | Length mm | Dim. B mm | Usable cross-section cm² | Dim. L mm | Dim. x mm | Dimension y mm |
|---|---|---|---|---|---|---|
| MKSM 610 FT | 3050 | 100 | 58 | 30 | – | 62 |
| MKSM 620 FT | 3050 | 200 | 118 | 80 | 96 | 162 |
| MKSM 630 FT | 3050 | 300 | 178 | 180 | 196 | 262 |
| MKSM 640 FT | 3050 | 400 | 238 | 280 | 296 | 362 |
| MKSM 650 FT | 3050 | 500 | 298 | 380 | 396 | 462 |
| MKSM 660 FT | 3050 | 600 | 358 | 480 | 496 | 562 |

## Load




| | 1.5 m kN/m | 2.0 m kN/m | 2.5 m kN/m |
|---|---|---|---|
| **MKSM 610 FT** | 1.6 | 1.1 | 0.7 |
| **MKSM 620 FT** | 1.5 | 1.1 | 0.7 |
| **MKSM 630 FT** | 1.5 | 1 | 0.7 |
| **MKSM 640 FT** | 1.5 | 1 | 0.7 |
| **MKSM 650 FT** | 1.5 | 1 | 0.7 |
| **MKSM 660 FT** | 1.5 | 1 | 0.7 |

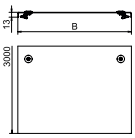
**Load diagram, cable tray, type MKSM 60**

1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm
— Strut bend curve according to support width

## Cover with turn buckle

St DD




| Type | Dim. B mm | Metal thick-ness mm | Length mm | Min. order-ing quan-tity m | Item no. |
|---|---|---|---|---|---|
| **DRL 100 DD** | 100 | 1.00 | 3000 | 3 | **6052703** |
| **DRL 200 DD** | 200 | 1.00 | 3000 | 3 | **6052709** |
| **DRL 300 DD** | 300 | 1.00 | 3000 | 3 | **6052712** |
| **DRL 400 DD** | 400 | 1.00 | 3000 | 3 | **6052715** |

Transverse bead from 500 mm width.
Cover for cable trays and cable ladders with turn buckles.
When using covers outdoors, additional measures against the influence of wind must be taken.

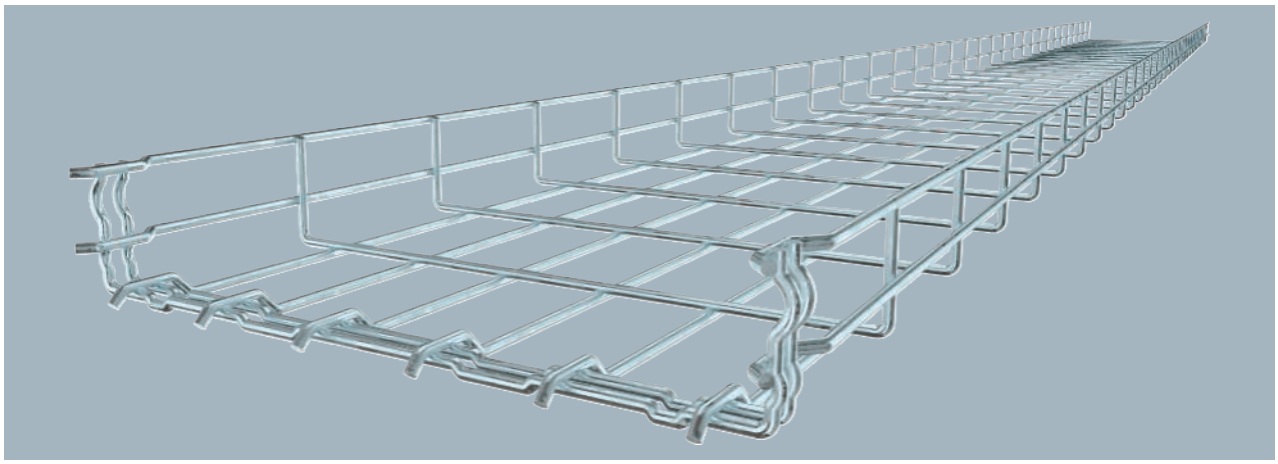


Always indicate the item number when ordering.

St FT

E30 E60 E90

# GR-Magic® 55 mesh cable tray



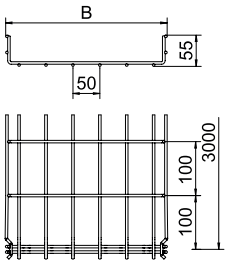
Mesh cable tray with shaped connector of side height 55 mm.

Magnetic shield insulation without cover 15 dB, with cover 25 dB. You can find detailed information regarding the UL classification in the respective certification.

No additional connection components are required for the mesh cable tray, it is simply interlocked. The grid width is 50 x 100 mm (exception: GRM 55/50 = 20 x 100 mm).

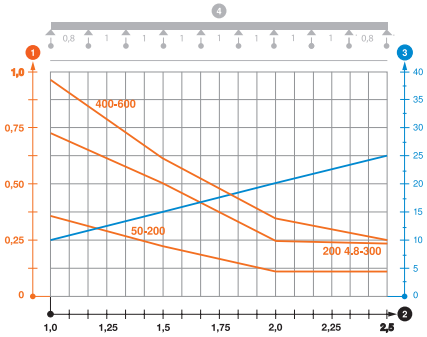
| Type | Width mm | Wire Ø mm | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|
| **GRM 55 50 FT** | 50 | 3.9 | 3 | | **6001415** |
| **GRM 55 100 FT** | 100 | 3.9 | 3 | | **6001416** |
| **GRM 55 200 FT** | 200 | 3.9 | 3 | | **6001420** |
| **GRM 55 300 FT** | 300 | 4.8 | 3 | | **6001424** |
| **GRM 55 400 FT** | 400 | 4.8 | 3 | | **6001428** |
| **GRM 55 500 FT** | 500 | 4.8 | 3 | | **6001432** |
| **GRM 55 600 FT** | 600 | 4.8 | 3 | | **6001436** |

## Dimensions




| Type | Length mm | Dim. B mm | Usable cross-section cm² |
|---|---|---|---|
| GRM 55 50 FT | 3000 | 52 | 16 |
| GRM 55 100 FT | 3000 | 100 | 40 |
| GRM 55 200 FT | 3000 | 200 | 87 |
| GRM 55 300 FT | 3000 | 300 | 129 |
| GRM 55 400 FT | 3000 | 400 | 175 |
| GRM 55 500 FT | 3000 | 500 | 220 |
| GRM 55 600 FT | 3000 | 600 | 265 |

## Load




| | 1.0 m kN/m | 1.5 m kN/m | 2.0 m kN/m | 2.5 m kN/m |
|---|---|---|---|---|
| **GRM 55 50 FT** | 0.35 | 0.2 | 0.1 | 0.1 |
| **GRM 55 100 FT** | 0.35 | 0.2 | 0.1 | 0.1 |
| **GRM 55 200 FT** | 0.35 | 0.2 | 0.1 | 0.1 |
| **GRM 55 300 FT** | 0.7 | 0.5 | 0.25 | 0.2 |
| **GRM 55 400 FT** | 0.9 | 0.6 | 0.3 | 0.25 |
| **GRM 55 500 FT** | 0.9 | 0.6 | 0.3 | 0.25 |
| **GRM 55 600 FT** | 0.9 | 0.6 | 0.3 | 0.25 |

**Load diagram, GR-Magic mesh cable tray, type GRM 55**

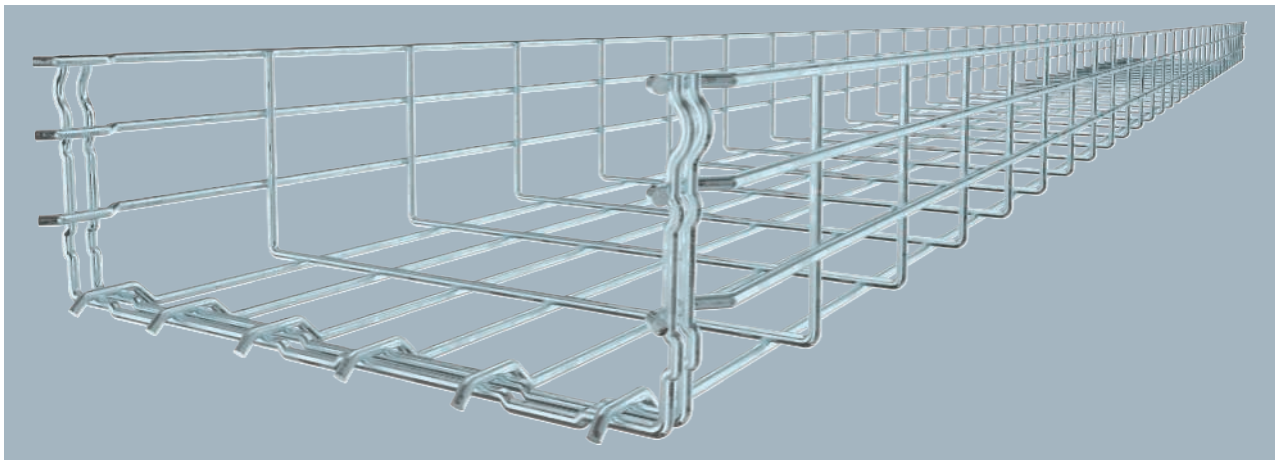
1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm

— Strut bend curve according to support width

## Mesh cable tray GR-Magic® 105

St FT

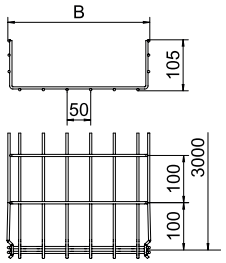


| Type | Width mm | Wire Ø mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **GRM 105 100 FT** | 100 | 3.9 | 3 | **6002431** |
| **GRM 105 200 FT** | 200 | 4.8 | 3 | **6002435** |
| **GRM 105 300 FT** | 300 | 4.8 | 3 | **6002437** |
| **GRM 105 400 FT** | 400 | 4.8 | 3 | **6002439** |
| **GRM 105 500 FT** | 500 | 4.8 | 3 | **6002443** |
| **GRM 105 600 FT** | 600 | 4.8 | 3 | **6002445** |

Mesh cable tray with shaped connector of side height 105 mm.
Magnetic shield insulation without cover 15 dB, with cover 25 dB.
No additional connection components are required for the mesh cable tray, it is simply interlocked. The grid width is 50 x 100 mm.

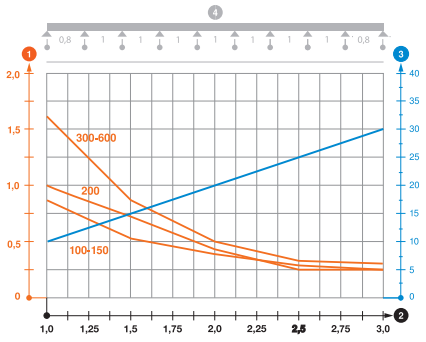
| Type | Length mm | Dim. B mm | Usable cross-section cm² |
|---|---|---|---|
| GRM 105 100 FT | 3000 | 100 | 82 |
| GRM 105 200 FT | 3000 | 200 | 175 |
| GRM 105 300 FT | 3000 | 300 | 268 |
| GRM 105 400 FT | 3000 | 400 | 363 |
| GRM 105 500 FT | 3000 | 500 | 459 |
| GRM 105 600 FT | 3000 | 600 | 554 |

**Dimensions**




| | 1.0 m kN/m | 1.5 m kN/m | 2.0 m kN/m | 3.0 m kN/m |
|---|---|---|---|---|
| **GRM 105 100 FT** | 0.8 | 0.55 | 0.37 | 0.25 |
| **GRM 105 200 FT** | 1 | 0.7 | 0.4 | 0.25 |
| **GRM 105 300 FT** | 1.6 | 0.8 | 0.5 | 0.3 |
| **GRM 105 400 FT** | 1.6 | 0.8 | 0.5 | 0.3 |
| **GRM 105 500 FT** | 1.6 | 0.8 | 0.5 | 0.3 |
| **GRM 105 600 FT** | 1.6 | 0.8 | 0.5 | 0.3 |

**Load**




**Load diagram, mesh cable tray, type GRM 105**

1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm
— Strut bend curve according to support width



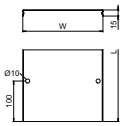
Always indicate the item number when ordering.

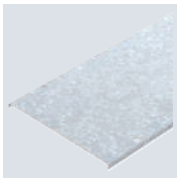
St FS FT

CE

## Cover for mesh cable tray, latchable

| Type | Dim. B mm | Metal thick-ness mm | Length mm | Min. order-ing quan-tity m | Item no. |
|---|---|---|---|---|---|
| **DGRR 50 FT** | 50 | 0.75 | 3000 | 3 | **6001820** |
| **DGRR 100 FT** | 98 | 0.75 | 3000 | 3 | **6001822** |
| **DGRR 200 FT** | 198 | 0.75 | 3000 | 3 | **6001826** |
| **DGRR 300 FT** | 298 | 0.75 | 3000 | 3 | **6001828** |
| **DGRR 400 FT** | 398 | 0.75 | 3000 | 3 | **6001830** |
| **DGRR 500 FS** | 498 | 0.75 | 3000 | 3 | **6001852** |
| **DGRR 600 FS** | 598 | 0.75 | 3000 | 3 | **6001854** |



With transverse bead from 400 mm width.

Lockable cover for mesh cable trays of type GR and GRM. Protects cables from damage, contamination and moisture from above. Suitable for industrial areas such as mechanical engineering.

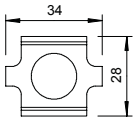
When using covers outdoors, additional measures against the influence of wind may need to be taken.

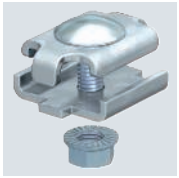
St FT

CE

## Joint connector GSV 34

| Type | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|
| **GSV 34 FT** | 20 | **6016634** |



Screwed version of joint connector for mesh cable trays.

Figure: Positioning and quantity of mesh cable tray connectors.
50–150 mm = 2 units
200–300 mm = 3 units
400–450 mm = 4 units
500–600 mm = 5 units

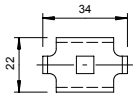
Including FRS M6 x 20 bolt with flange nut.

St FT

CE

## GKS 34 hold-down clamp

| Type | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|
| **GKS 34 FT** | 20 | **6016820** |




Including FRS M6 x 20 bolt with flange nut.

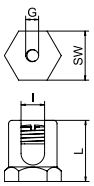
Hold-down clamp for fixing mesh cable trays to wall or support brackets.

CuZn 37

CE

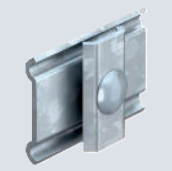
## Earthing terminal with fastening thread

| Type | Dim. L mm | Dim. l mm | Cross-section mm² | Thread metric | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|---|---|---|---|
| **EKL 35 M6** | 26 | 10 | 75 | 6 | 50 | **6404014** |




Earthing terminal for fastening the equipotential bonding wire to the cable support system. M12 threaded pin with slot.
Suitable for conductor cross sections of 4–50 mm².

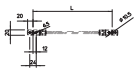
## K 11/262 side connector




| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **K 11 262 FT** | 25 | **6015107** |

Screwed version of joint connector for mesh cable trays.
Including screw of type FRS M6 x 20.

## Bridging cable

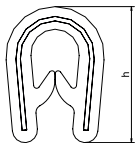


| Type | Dim. L mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **853 200** | 200 | 10 | **5331008** |

- With aluminium cable lugs
- From flexible copper cable 16 mm²
- Coating: Black, chlorinated EM5 natural rubber mixture
- With 1 fastening hole Ø 10.5 mm per attachment side
- With 2 fastening holes Ø 6.5 mm per attachment side
- Suitable for applications outside or inside
- Temperature range –25 °C to +80 °C (moved) and –40 °C to +80 °C (not moved)
- UV-resistant

## Edge protection strip

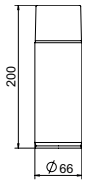
PVC




| Type | For metal thickness mm | Dim. h mm | Colour | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|---|
| **KSB 4 PVC** | 1.5-4 | 15 | Black | 10000 | 10 | **6072895** |

Edge protection strip with steel core for covering cut metal edges. Black version, UV-resistant.

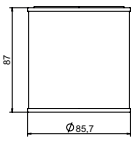
## Zinc repairs




| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **ZSF** | 1 | **2362970** |

The zinc spray can be used in the temperature range - 10 °C to 40 °C.
Zinc spray for treatment of unprotected surfaces and cutting edges. Can contents: 400 ml.

## Zinc repair paint

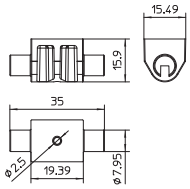



| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **ZABF** | 1 | **2362979** |

Zinc repair paint for blank areas on the hot galvanised steel parts, to eliminate grinding and welding damage on the galvanisation and to adapt ungalvanised small parts on galvanised structures.
Resistant to normal weathering influences. Light shade, similar to zinc. Before paint application, the substrate must be carefully cleaned and roughened. Paint application with a brush.

## Universal flat conductor adapter for roof conductor holder, type 165/MBG

PP




| Type | Colour | Fit mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **165 MBG UH** | Black | Rd 8 | 25 | **5218882** |

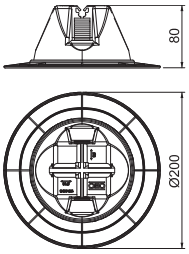
- Universal adapter with drill hole Ø 2.5 mm
- E.g. for OBO Golden Sprint screw, type 4758 4 x L (L = depending on application)
- For fastening to 165/MBG

PP/ PE

## Roof conductor holder for flat roofs, with increased base section

| Type | Fit mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **165 MBG-8-10 200** | Rd 8-10 | 4 | | **5218716** |

- Closed form with base
- With double conductor holder
- Filling weight 1 kg (frost-resistant concrete)
- Sleeve from polyethylene, black, UV-resistant and weatherproof
- Base made of polypropylene, black, UV-resistant and weather-resistant
- With larger base section (Ø 200 mm) for better stability

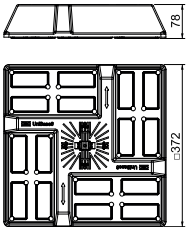


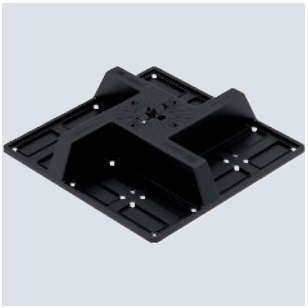

ASA

## UniBase universal stand

| Type | Length mm | Width mm | Height mm | Fit mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|---|
| **UniBase 6** | 372 | 372 | 78 | 5 | 16 | | 81.000 | **5403391** |

Universal stand for ballasting with standard blocks up to a dimension of 200 x 100 x 100 mm. Can be used on flat roofs, e.g. for mounting PV mounting systems or for cable routing with cable trays or with mesh cable trays in conjunction with roof cable holder 165 MBG HGRM. Blocks not contained in the scope of delivery.

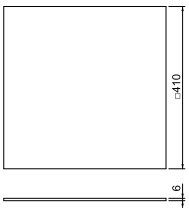


## Building protection mat, flat roof

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **UniBase BSM** | 410 | 410 | 6 | 16 | | 73.950 | **5403402** |
| **UniBase BSM ALU** | 410 | 410 | 6 | 16 | | 75.330 | **5403404** |

Building protection mat as an underlay under stands of type UniBase 6 + UniBase 10 for flat roof PV mounting systems, as protection of the roof seal on flat roofs according to DIN 18531. Also suitable for height compensation of the PV mounting system. Made of recycled material; depending on the version, also available with aluminium lining.

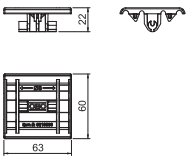



PP

## Mesh cable tray adapter for roof conductor holder

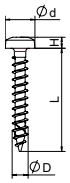
| Type | Colour | Fit mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **165 MBG HGRM** | Black | Rd 8 | 50 | | **5218886** |

- Adapter for GR-Magic® mesh cable trays with a mesh width of 50 mm or 20 mm
- For fastening to type 165 MBG 8-10 and UniBase
- Mounting without tools
- From polypropylene, black, UV-resistant and weatherproof
- Toolless installation




## Chipboard screw, with Torx, panhead, stainless steel

A4 2B



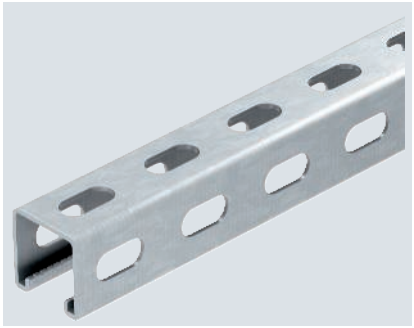

| Type | Dim. L mm | Dim. D mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **OTSP 4,0x25 A4** | 25 | 4 | 100 | **3191006** |
| **OTSP 4,0x30 A4** | 30 | 4 | 100 | **3191008** |
| **OTSP 4,0x40 A4** | 40 | 4 | 100 | **3191010** |
| **OTSP 5,0x40 A4** | 40 | 5 | 100 | **3191024** |
| **OTSP 6,0x40 A4** | 40 | 6 | 100 | **3191032** |

Stainless steel wood screw with lens head and Torx drive for fastenings in interior and exterior areas.
Areas of use: Wood, chipboard, plasterboard panels and plastic anchors.

## MS4141 mounting rail, slot width 22 mm, side perforation

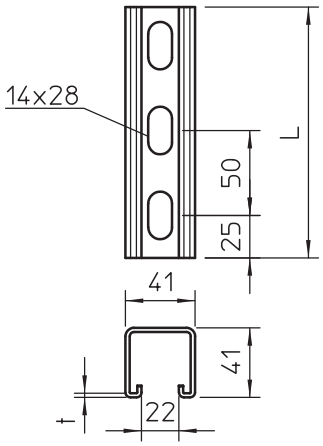
St FT

E30 E90



Heavy-duty C profile rail for individual installation of support constructions, e.g. for cable trays or as a panel for switchgear cabinets. Can also be used for cable routing, in conjunction with clamp clips with a U foot.

| Type | Length mm | Material thickness mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **MS4141PP1000FT** | 1000 | 2.5 | 1 | **1122479** |
| **MS4141PP3000FT** | 3000 | 2.5 | 3 | **1122483** |






Always indicate the item number when ordering.

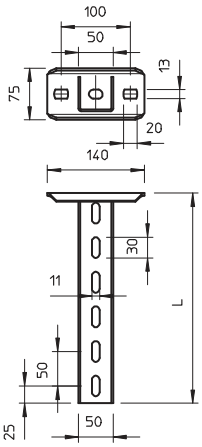
St FT

# US 5 support

| Type | Length mm | Material thickness mm | Tensile load kN | BS | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|
| **US 5 K 20 FT** | 200 | 2.5 | 10 | | 1 | | **6341527** |
| **US 5 K 30 FT** | 300 | 2.5 | 10 | | 1 | | **6341535** |
| **US 5 K 40 FT** | 400 | 2.5 | 10 | | 1 | | **6341543** |
| **US 5 K 50 FT** | 500 | 2.5 | 10 | | 1 | | **6341551** |
| **US 5 K 60 FT** | 600 | 2.5 | 10 | | 1 | | **6341578** |
| **US 5 K 70 FT** | 700 | 2.5 | 10 | | 1 | | **6341586** |
| **US 5 K 80 FT** | 800 | 2.5 | 10 | | 1 | | **6341594** |
| **US 5 K 90 FT** | 900 | 2.5 | 10 | | 1 | | **6341608** |
| **US 5 K 100 FT** | 1000 | 2.5 | 10 | | 1 | | **6341616** |
| **US 5 K 110 FT** | 1100 | 2.5 | 10 | | 1 | | **6341624** |
| **US 5 K 120 FT** | 1200 | 2.5 | 10 | | 1 | | **6341632** |

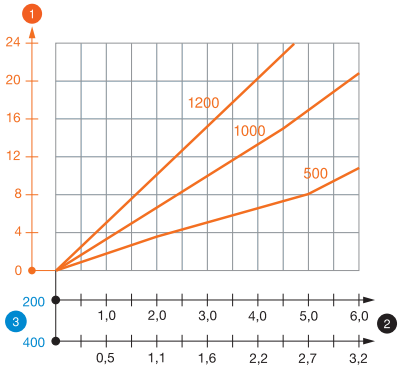
For fastening to horizontal concrete ceilings and steel girders. For bracket widths of 400 mm or more, or if the bracket is mounted at the end of a suspended support, we recommend the use of the spacer, type DSK 45.

U support of dimensions 50 x 50 mm with welded head plate.




## Load

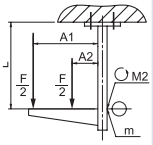
### Load diagram, U support, type US 5 K




1 Bending of the end of the suspended support at permitted bracket load
2 Permitted bracket load in kN without man load
3 Bracket length in mm
— Load curves with support lengths in mm

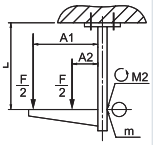
### Testing of the bending torque on the support with bracket

| Item on test | US 5 K 80 | US 5 K 120 |
|---|---|---|
| | AW 30 31 FT | AW 30 31 FT |
| Deformation measuring point m | | |
| A1 lever arm | 310 mm | 310 mm |
| A2 lever arm | 10 mm | 10 mm |
| Length L | 500 mm | 1,000 mm |
| Force F | 1.253 kN | 1.358 kN |
| Bending torque M2 (SWL) | 240 Nm | 260 Nm |




### Testing of the bending torque on the support with bracket with spacer

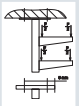
| Item on test | US 5 K 80 | US 5 K 120 |
|---|---|---|
| | AW 30 71 FT | AW 30 71 FT |
| Deformation measuring point m | | |
| A1 lever arm | 710 mm | 710 mm |
| A2 lever arm | 10 mm | 10 mm |
| Length L | 500 mm | 1,000 mm |
| Force F | 1.272 kN | 1.094 kN |
| Bending torque M2 (SWL) | 500 Nm | 430 Nm |




According to IEC 61537, Chapter 10.8.2.3

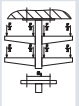
### Characteristic anchor load values for US 5 K support

**Single-sided load**



| Anchor type | Max. load [kN] Bracket width [mm] 110% | 210 | 310 | 410 |
|---|---|---|---|---|
| BZ3 10x90/0-30 | 4,31 | 3,18 | 2,51 | 2,06 |
| BZ3 12x110/0-35 | 5,82 | 4,29 | 3,39 | 2,77 |

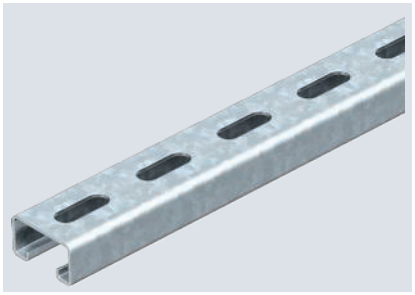
**Double-sided load**



| Anchor type | Max. load [kN] Bracket width [mm] 110% | 210 | 310 | 410 | 510 | 610 |
|---|---|---|---|---|---|---|
| BZ3 10x90/0-30 | 8,56 | 7,24 | 6,20 | 5,17 | 4,58 | 4,12 |
| BZ3 12x110/0-35 | 11,58 | 9,79 | 8,38 | 6,99 | 6,19 | 5,57 |

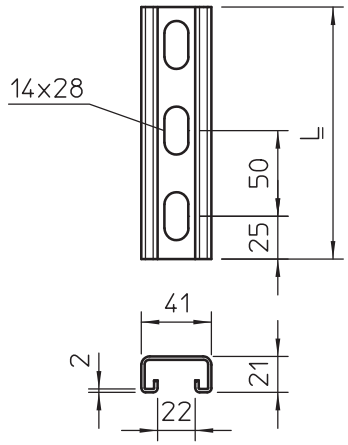
Max. total load F = cable weight + cable tray + bracket + suspended support.
The tabular values for double-sided loads take the available axis spacing ai = 10 cm into account.
The stated values are based on uncracked concrete of compressive strength C20/25. Please comply with the installation conditions of ETA(anchors).

## MS4121 mounting rail, slot 22 mm, perforated

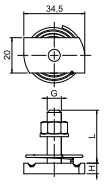


Heavy-duty C profile rail for individual installation of support constructions, e.g. for cable trays or as a panel for switchgear cabinets. Can also be used for cable routing, in conjunction with clamp clips with a U foot.

| Type | Length mm | Material thickness mm | BS | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| **MS4121P2000FT** | 2000 | 2 | | 2 | **1122923** |
| **MS4121P3000FT** | 3000 | 2 | | 3 | **1122924** |
| **MS4121P6000FT** | 6000 | 2 | | 6 | **1122926** |



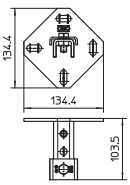

## Hammer-head bolt with spring




| Type | Length mm | Width mm | Height mm | Thread | Torque Nm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **MS41HBF M8x30 FT** | 34.5 | 20 | 6 | M 8 x 30 | 8 | 50 | **1148376** |
| **MS41HBF M10x30FT** | 34.5 | 20 | 8 | M 10 x 30 | 16.1 | 50 | **1148384** |
| **MS41HBF M12x30FT** | 34.5 | 20 | 9 | M 12 x 30 | 27 | 50 | **1148392** |

Hammer-head bolt with spring for use with MS4121 and MS4141 profile rails

## Wall, floor and ceiling bracket with 3 holes




| Type | Version | Dimension W x H mm | Material thickness mm | Length mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|
| **WBDHE 41 FT** | Perforated | 134x110 | 5 | 102 | 10 | **1123191** |

The wall, floor and ceiling bracket can ideally be used as a panel for wall, floor and ceiling mounting. Also suitable for stand and frame construction in conjunction with the mounting rails MS4141.



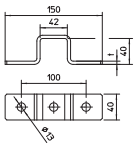
Always indicate the item number when ordering.

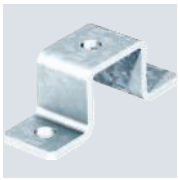
St FT

CE

## Omega clamp

| Type | Material thickness mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **GMS 3 O 4141 FT** | 5 | 10 | **1124673** |



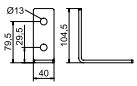
Fastening clip with 3 holes for cross-wise connection of profile rails 41 x 41 mm.

St FT

CE

## Mounting bracket, 90° with 4 holes

| Type | Version | Shipping box Piece | Material thickness mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **GMS 4 VW 90 FT** | 90° angle | 40 | 5 | 10 | **1124663** |



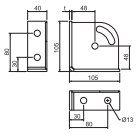

Mounting bracket with four holes to connect profile rails 41 x 41 mm and 41 x 21 mm at an angle of 90°.

St FT

CE

## Mounting bracket, 90° with 6 holes

| Type | Version | Material thickness mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **GMS 6 KD FT** | 90° bracket | 5 | 10 | **1124792** |



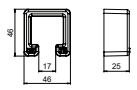
Reinforced mounting bracket with 6 holes to connect profile rails 41 x 41 mm and 41 x 21 mm at an angle of 90°. Additional fastening option for a strut at an angle of 45° with an adjusting range of +/- 30°. Can be used for angles between 15° and 75°.

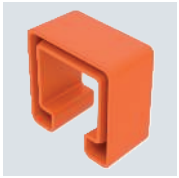
PE

CE HALOGEN FREE

## End cap MS4141

| Type | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **MS4141 SK** | Pastel orange | 25 | **1122900** |



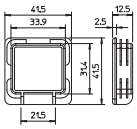
End cap for profile rail, type MS4141.

PE

CE

## Protective cap MS4141

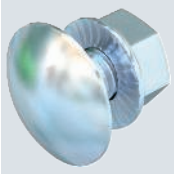
| Type | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **MS4141 EK** | Pastel orange | 50 | **1122906** |

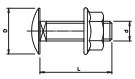



Protective cap for profile rail, type MS4141.

## Truss-head bolt with flange nut

St F





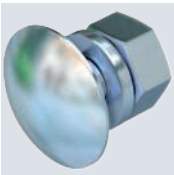
| Type | Dimension mm | Dim. L mm | Dim. d mm | Dim. D mm | Resistance grade | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **FRSB 6x12 VZ F** | M 6 x 12 | 12 | 6 | 13.5 | 5.6 | 10 | **6406125** |

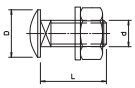
Truss-head bolt with square neck including flange nut.

## Truss-head bolt with nut and washer

St F

CE





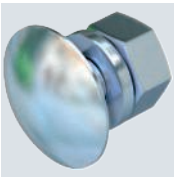
| Type | Dimension mm | Dim. L mm | Dim. d mm | Dim. D mm | Resistance grade | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **FRS 8x25 F** | M 8 x 25 | 25 | 8 | 20 | 8.8 | 50 | **6406998** |

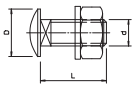
Truss-head bolt with square neck. With washer and hexagonal nut.
The truss-head bolt can be used in combination with hot-dip and double-dip galvanised articles.

## Truss-head bolt with nut and washer

St F

CE





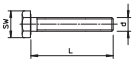
| Type | Dimension mm | Dim. L mm | Dim. d mm | Dim. D mm | Resistance grade | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **FRS 10x25 TPS F** | M 10 x 25 | 25 | 10 | 18 | 5.6 | 50 | **6407536** |
| **FRS 12x25 F** | M 12 x 25 | 25 | 12 | 30 | 5.6 | 50 | **6406254** |

Truss-head bolt with square neck. With washer and hexagonal nut.
The truss-head bolt can be used in combination with hot-dip and double-dip galvanised articles.

## Hexagonal bolt M10

St F

CE



| Type | Dimension mm | Dim. L mm | Dim. d mm | SW mm | Resistance grade | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **SKS 10x90 F** | M 10 x 90 | 90 | 10 | 17 | 8.8 | 20 | **6418252** |

Hexagonal bolt for universal fastening of construction components. With hexagonal nut and 2 washers.

## Hexagonal bolt M12

St F

CE

| Type | Dimension mm | Dim. L mm | Dim. d mm | SW mm | Resistance grade | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|
| **SKS 12x30 F** | M 12 x 30 | 30 | 12 | 19 | 8.8 | 20 | **3163091** |

Hexagonal bolt for universal fastening of construction components. With hexagonal nut and 2 washers.

# Safe routing of PV cables outdoors

## PV cable routing in outdoor areas with OBO vertical ladders

OBO vertical cable ladders enable the tidy routing of, for example, string and distributing cables as well as protective earthing and functional bonding conductors along the facade, specifically for PV systems. Generally, they are fastened directly to the facade and adapted to the respective structural conditions. They easily bridge the height differences between the PV system on the roof and the technical room or mains connection point.

- Corrosion-resistant version made of hot-dip galvanised steel for outdoor applications
- Meeting the requirements according to DIN EN 61537 (cable support systems)
- The modular structure makes it easy to adapt the system to the building structures and ensures rapid mounting
- Designed for multiple cable harnesses routed in parallel, including with larger cross-sections (e.g. DC distributing main)
- Open design promotes heat dissipation
- Can be combined with other OBO solutions such as cable trays, earthing systems and lightning protection

## Cable ladder LG 60, 6 m VS

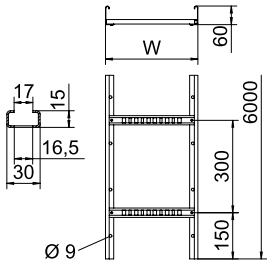
| Type | Width mm | BS | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **LG 620 VS 6 FT** | 200 | | 6 | **6208650** |
| **LG 630 VS 6 FT** | 300 | | 6 | **6208653** |
| **LG 640 VS 6 FT** | 400 | | 6 | **6208656** |
| **LG 650 VS 6 FT** | 500 | | 6 | **6208659** |
| **LG 660 VS 6 FT** | 600 | | 6 | **6208661** |

Cable ladder with perforated side rail of side height 60 mm with riveted C profile frames, open in an upwards direction (VS version).

The cable ladder is shipped folded up.
Cables can be mounted with the matching clamp clip, type 2056.
The cable ladders in the widths 200 mm to 400 mm are also approved for vertical mounting as a vertical ladder in systems that guarantee the maintenance of electrical functionality according to DIN 4102 Part 12. Cables can be mounted with the clamp clip approved for maintenance of electrical function, type 2056 M.

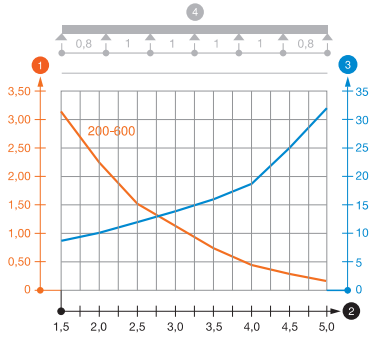
| Type | Length mm | Dim. B mm | Rail thickness mm | Usable cross-section $cm^2$ | Rung spacing mm |
|---|---|---|---|---|---|
| LG 620 VS 6 FT | 6000 | 200 | 1.5 | 98 | 300 |
| LG 630 VS 6 FT | 6000 | 300 | 1.5 | 148 | 300 |
| LG 640 VS 6 FT | 6000 | 400 | 1.5 | 198 | 300 |
| LG 650 VS 6 FT | 6000 | 500 | 1.5 | 248 | 300 |
| LG 660 VS 6 FT | 6000 | 600 | 1.5 | 298 | 300 |

### Dimensions




| | 1.5 m kN/m | 2.0 m kN/m | 2.5 m kN/m | 3.0 m kN/m | 4.0 m kN/m | 4.5 m kN/m | 5.0 m kN/m |
|---|---|---|---|---|---|---|---|
| **LG 620 VS 6 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 630 VS 6 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 640 VS 6 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 650 VS 6 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 660 VS 6 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |

### Load




### Load diagram, LG 60 VS

1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm

— Strut bend curve according to support width

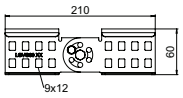
St FT

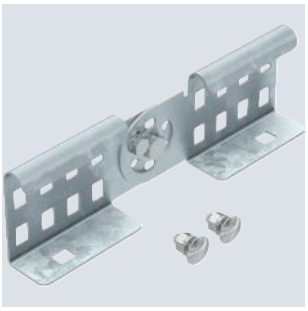
## Adjustable connector 60

| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **LGVG 60 FT** | 60 | 10 | **6208944** |

Adjustable connector as external connector to join cable ladders and fittings with a side height of 60 mm and continuous rail perforation. Angle can be adjusted vertically.

The bolt fastening ensures the continuity of the equipotential bonding.



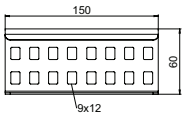
St FT

## Straight connector 60

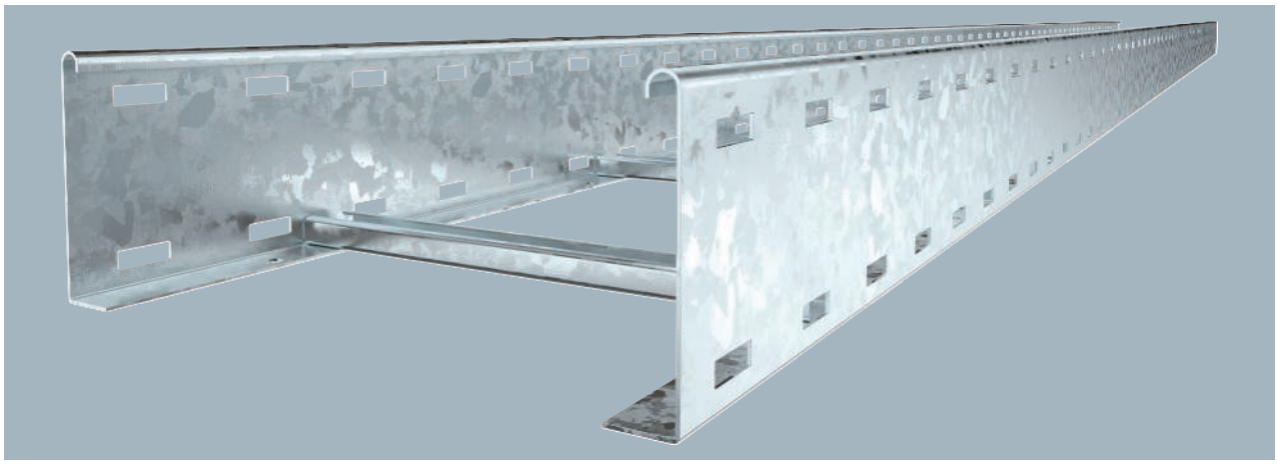
| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **LVG 60 FT** | 60 | 10 | **6208843** |

Straight connector as external connector to connect cable ladders and fittings with a side height of 60 mm and continuous rail perforation.

The bolt fastening ensures the continuity of the equipotential bonding.




## Cable ladder LG 110, 6 m VS



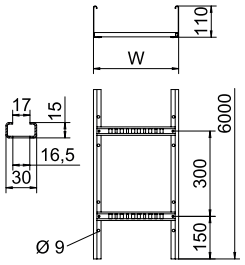
| Type | Width mm | Min. ordering quantity m | Item no. |
|---|---|---|---|
| **LG 112 VS 6 FT** | 200 | 6 | **6216465** |
| **LG 113 VS 6 FT** | 300 | 6 | **6216468** |
| **LG 114 VS 6 FT** | 400 | 6 | **6216471** |
| **LG 115 VS 6 FT** | 500 | 6 | **6216474** |
| **LG 116 VS 6 FT** | 600 | 6 | **6216477** |

Cable ladder with perforated side rail of side height 110 mm with riveted C profile rungs, open in an upwards direction.

The cable ladder is shipped folded up.
You can find the appropriate type 2056 clamp clip in the vertical ladder systems section.

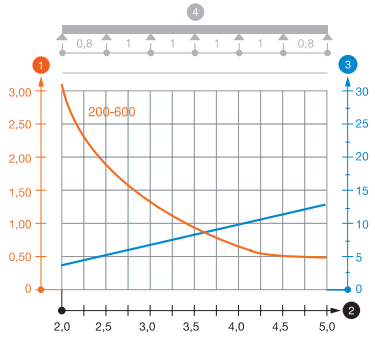
| Type | Length mm | Dim. B mm | Rail thickness mm | Usable cross-section $cm^2$ | Rung spacing mm |
|---|---|---|---|---|---|
| LG 112 VS 6 FT | 6000 | 200 | 1.5 | 188 | 300 |
| LG 113 VS 6 FT | 6000 | 300 | 1.5 | 283 | 300 |
| LG 114 VS 6 FT | 6000 | 400 | 1.5 | 378 | 300 |
| LG 115 VS 6 FT | 6000 | 500 | 1.5 | 475 | 300 |
| LG 116 VS 6 FT | 6000 | 600 | 1.5 | 568 | 300 |

### Dimensions




| | 2.0 m kN/m | 3.0 m kN/m | 4.0 m kN/m | 5.0 m kN/m | 6.0 m kN/m |
|---|---|---|---|---|---|
| **LG 112 VS 6 FT** | 3.1 | 1.4 | 0.65 | 0.5 | 0.15 |
| **LG 113 VS 6 FT** | 3.1 | 1.4 | 0.65 | 0.5 | 0.15 |
| **LG 114 VS 6 FT** | 3.1 | 1.4 | 0.65 | 0.5 | 0.15 |
| **LG 115 VS 6 FT** | 3.1 | 1.4 | 0.65 | 0.5 | 0.15 |
| **LG 116 VS 6 FT** | 3.1 | 1.4 | 0.65 | 0.5 | 0.15 |

### Load




### Load diagram, cable ladder, type LG 110 VS

1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm

— Strut bend curve according to support width

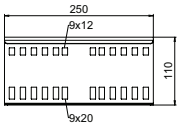
St FT

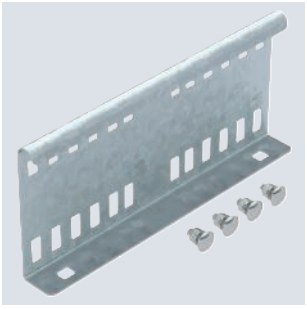
## Straight connector 110

| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **LVG 110 FT** | 110 | 10 | **6216548** |

Straight connector as external connector to connect cable ladders and fittings with a side height of 110 mm and continuous rail perforation.

The bolt fastening ensures the continuity of the equipotential bonding.



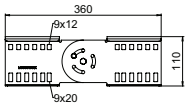
St FT

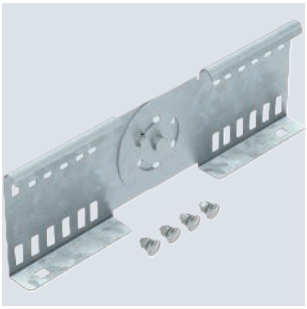
## Adjustable connector 110

| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **LGVG 110 FT** | 110 | 10 | **6216653** |

Adjustable connector as internal connector to join cable ladders and fittings with a side height of 110 mm. Angle can be adjusted vertically.

The bolt fastening ensures the continuity of the equipotential bonding.



St FT

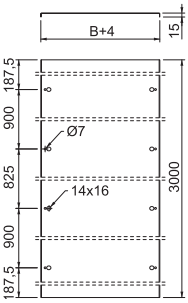
## Cover for stand-off mounting

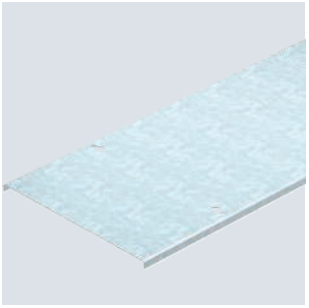
| Type | Width mm | Metal thickness mm | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| **DRL FAM 230 FT** | 230 | 1.50 | 3000 | 3 | **6051222** |
| **DRL FAM 330 FT** | 330 | 1.50 | 3000 | 3 | **6051224** |
| **DRL FAM 430 FT** | 430 | 1.50 | 3000 | 3 | **6051226** |
| **DRL FAM 530 FT** | 530 | 1.50 | 3000 | 3 | **6051228** |
| **DRL FAM 630 FT** | 630 | 1.50 | 3000 | 3 | **6051230** |

Cover for stand-off mounting. Not suitable for the vertical ladders SLM and SLS.

Spacers must ordered separately for every 3 m under article number 6065475 for cable trays and cable ladders as well as under article number 6065477 for wide span systems.

When using covers outdoors, additional measures against the influence of wind must be taken.



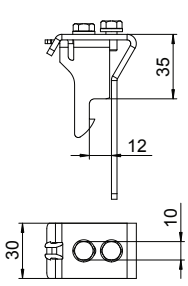



A2 2B

## Spacer for cover

| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **AH 35 A2** | 35 | 8 | **6065475** |

Spacers for stand-off cover mounting on cable trays and cable ladders. Space height 35 mm, stainless steel 1.4301.



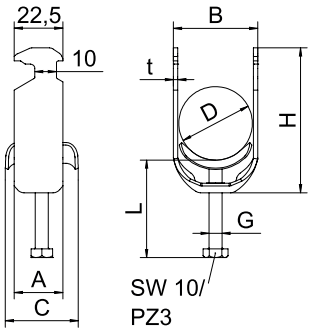

## Clamp clip 2056 H-foot, 1-fold, metal pressure sleeve

St FT
16-17 H E30 E60 E90 40 kA

| Type | Clamping range D mm | BS | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **BS-H1-M-12 FT** | 8-12 | | 100 | **1186002** |
| **BS-H1-M-16 FT** | 12-16 | | 100 | **1186009** |
| **BS-H1-M-22 FT** | 16-22 | | 100 | **1186016** |
| **BS-H1-M-28 FT** | 22-28 | | 100 | **1186022** |
| **BS-H1-M-34 FT** | 28-34 | | 100 | **1186029** |
| **BS-H1-M-40 FT** | 34-40 | | 100 | **1186036** |
| **BS-H1-M-46 FT** | 40-46 | | 100 | **1186042** |
| **BS-H1-M-52 FT** | 46-52 | | 100 | **1186049** |
| **BS-H1-M-58 FT** | 52-58 | | 100 | **1186056** |
| **BS-H1-M-64 FT** | 58-64 | | 100 | **1186062** |
| **BS-H1-M-70 FT** | 64-70 | | 50 | **1186069** |
| **BS-H1-M-76 FT** | 70-76 | | 25 | **1186076** |
| **BS-H1-M-82 FT** | 76-82 | | 25 | **1186082** |
| **BS-H1-M-90 FT** | 82-90 | | 25 | **1186089** |
| **BS-H1-M-100 FT** | 90-100 | | 25 | **1186097** |

Clamp clip with hammerhead foot, metal pressure sleeve with rounded edges to protect the cable. For vertical and horizontal mounting of 1 single cable on a C-profile rail. For a slot width 16–17 mm. With 1-start screw thread on pressure sleeve, universal hexagonal screw head WAF10, with slot and cross recess. Suitable for assembly indoors and outdoors. The counter-sleeve must be ordered separately.

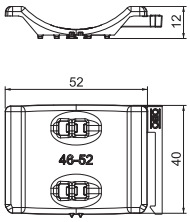
**Dimensions**




| Type | Clamping range D mm | Dim. A mm | Dim. B mm | Dim. C mm | Dim. G | Dim. t mm | Dim. H mm | Dim. L mm | Max. torque Nm |
|---|---|---|---|---|---|---|---|---|---|
| BS-H1-M-12 FT | 8-12 | 22.5 | 17 | 28 | M6 | 1.5 | 42 | 34 | 3 |
| BS-H1-M-16 FT | 12-16 | 22.5 | 20 | 28 | M6 | 1.5 | 46 | 34 | 3 |
| BS-H1-M-22 FT | 16-22 | 22.5 | 27 | 28 | M6 | 1.5 | 52 | 34 | 3 |
| BS-H1-M-28 FT | 22-28 | 22.5 | 33 | 28 | M6 | 2 | 59 | 34 | 3 |
| BS-H1-M-34 FT | 28-34 | 22.5 | 39 | 34 | M6 | 2 | 67 | 46 | 3 |
| BS-H1-M-40 FT | 34-40 | 22.5 | 45 | 33 | M6 | 2 | 74 | 46 | 3 |
| BS-H1-M-46 FT | 40-46 | 25 | 51 | 33 | M8 | 2 | 82 | 43 | 5 |
| BS-H1-M-52 FT | 46-52 | 25 | 57 | 33 | M8 | 2 | 89 | 43 | 5 |
| BS-H1-M-58 FT | 52-58 | 25 | 64 | 33 | M8 | 2.5 | 96 | 43 | 5 |
| BS-H1-M-64 FT | 58-64 | 25 | 70 | 33 | M8 | 2.5 | 102 | 43 | 5 |
| BS-H1-M-70 FT | 64-70 | 25 | 76 | 33 | M8 | 2.5 | 109 | 43 | 5 |
| BS-H1-M-76 FT | 70-76 | 25 | 82 | 37 | M8 | 2.5 | 115 | 55 | 5 |
| BS-H1-M-82 FT | 76-82 | 25 | 88 | 37 | M8 | 2.5 | 122 | 55 | 5 |
| BS-H1-M-90 FT | 82-90 | 27 | 97 | 38 | M8 | 3 | 132 | 55 | 5 |
| BS-H1-M-100 FT | 90-100 | 27 | 107 | 38 | M8 | 3 | 143 | 55 | 5 |

## Universal counter-trough, plastic

PP
F N H U W HALOGEN FREE

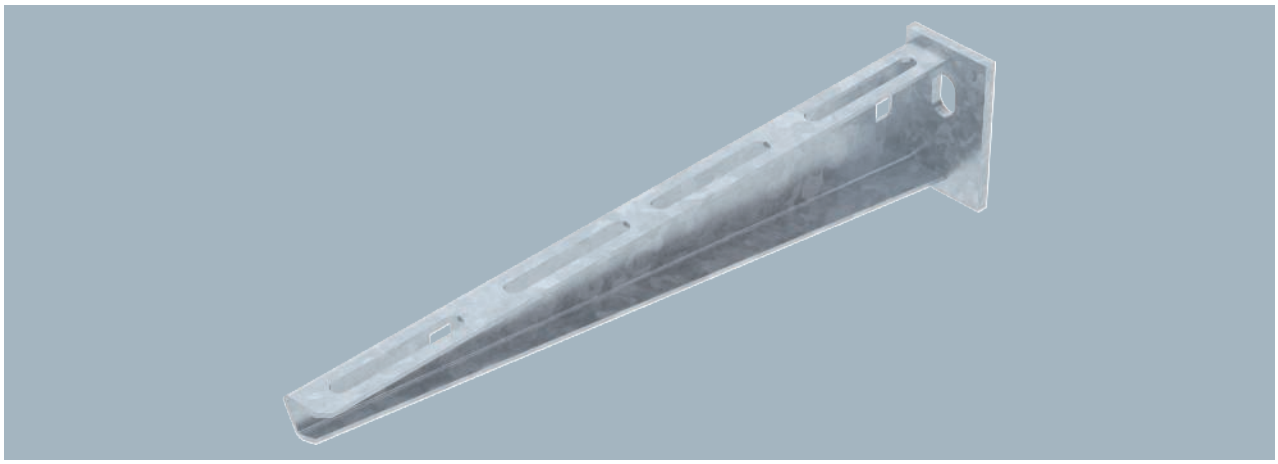



| Type | Clamping range D mm | Dim. L mm | Dim. B mm | Dim. H mm | Colour | Shipping box Piece | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|---|
| **2058UW 12 LGR** | 8-12 | 37 | 18.5 | 5.8 | Light grey | 1500 | 100 | **1198012** |
| **2058UW 16 LGR** | 12-16 | 37 | 21.5 | 5.8 | Light grey | 1600 | 100 | **1198016** |
| **2058UW 22 LGR** | 16-22 | 37 | 27.5 | 6.8 | Light grey | 1500 | 100 | **1198022** |
| **2058UW 28 LGR** | 22-28 | 37 | 33.5 | 8.3 | Light grey | 1200 | 100 | **1198028** |
| **2058UW 34 LGR** | 28-34 | 37 | 45.5 | 9.8 | Light grey | 1200 | 100 | **1198034** |
| **2058UW 40 LGR** | 34-40 | 37 | 45.5 | 10.8 | Light grey | 600 | 50 | **1198040** |
| **2058UW 46 LGR** | 40-46 | 40 | 51.5 | 11.8 | Light grey | 600 | 50 | **1198046** |
| **2058UW 52 LGR** | 46-52 | 40 | 57.5 | 11.8 | Light grey | 600 | 50 | **1198052** |
| **2058UW 58 LGR** | 52-58 | 40 | 63.5 | 11.8 | Light grey | 600 | 50 | **1198058** |
| **2058UW 64 LGR** | 58-64 | 40 | 69.5 | 11.8 | Light grey | 600 | 50 | **1198064** |
| **2058UW 70 LGR** | 64-70 | 40 | 75.5 | 12.3 | Light grey | 300 | 25 | **1198070** |
| **2058UW 76 LGR** | 70-76 | 40 | 81.5 | 12.3 | Light grey | 300 | 25 | **1198076** |
| **2058UW 82 LGR** | 76-82 | 40 | 87.5 | 12.3 | Light grey | 300 | 25 | **1198082** |
| **2058UW 90 LGR** | 82-90 | 40 | 96 | 12.8 | Light grey | 300 | 25 | **1198090** |
| **2058UW 100 LGR** | 90-100 | 40 | 106 | 12.8 | Light grey | 300 | 25 | **1198100** |

Regardless of the type of rail, the counter-trough can be used by applying it onto one side of the clamp clip. Due to an intelligent contour on the backside, the counter-trough can be combined to a double trough. Retrofitting possible without the need to dismantle.

## Wall and support bracket AW 15

St FT



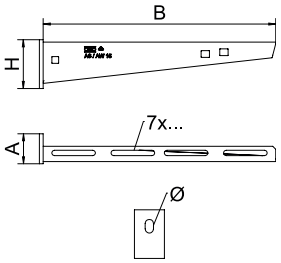
| Type | Width mm | F in kN | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **AW 15 11 FT** | 110 | 1.5 | 1 | | **6420656** |
| **AW 15 21 FT** | 210 | 1.5 | 1 | | **6420680** |
| **AW 15 31 FT** | 310 | 1.5 | 1 | | **6420710** |
| **AW 15 41 FT** | 410 | 1.5 | 1 | | **6420745** |
| **AW 15 51 FT** | 510 | 1.5 | 1 | | **6420788** |
| **AW 15 61 FT** | 610 | 1.5 | 1 | | **6420826** |

Fastening of the bracket to the U support of width 400 mm or greater using a hexagonal bolt through both sides of the support. Please insert suitable spacers.

Light-duty wall and support bracket with welded head plate.

| Type | Dim. B mm | Dim. A mm | Dim. H mm |
|---|---|---|---|
| AW 15 11 FT | 110 | 40 | 50 |
| AW 15 21 FT | 210 | 40 | 60 |
| AW 15 31 FT | 310 | 40 | 65 |
| AW 15 41 FT | 410 | 40 | 70 |
| AW 15 51 FT | 510 | 40 | 75 |
| AW 15 61 FT | 610 | 40 | 80 |

**Dimensions**



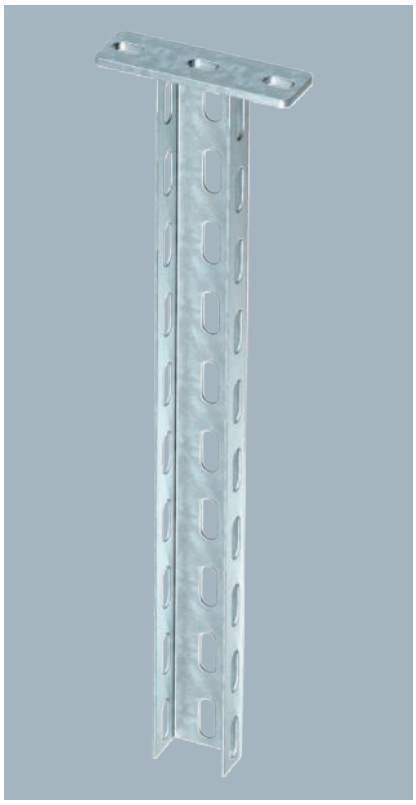



Always indicate the item number when ordering.

St FT

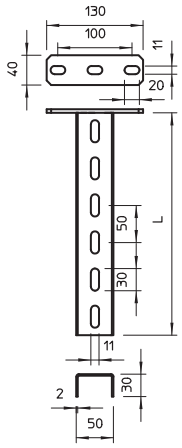
# US 3 support

| Type | Length mm | Material thickness mm | Tensile load kN | BS | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|
| **US 3 K 20 FT** | 200 | 2 | 5 | | 1 | | **6342351** |
| **US 3 K 30 FT** | 300 | 2 | 5 | | 1 | | **6342353** |
| **US 3 K 40 FT** | 400 | 2 | 5 | | 1 | | **6342355** |
| **US 3 K 50 FT** | 500 | 2 | 5 | | 1 | | **6342357** |
| **US 3 K 60 FT** | 600 | 2 | 5 | | 1 | | **6342359** |
| **US 3 K 70 FT** | 700 | 2 | 5 | | 1 | | **6342362** |
| **US 3 K 80 FT** | 800 | 2 | 5 | | 1 | | **6342364** |
| **US 3 K 90 FT** | 900 | 2 | 5 | | 1 | | **6342366** |
| **US 3 K 100 FT** | 1000 | 2 | 5 | | 1 | | **6342368** |
| **US 3 K 110 FT** | 1100 | 2 | 5 | | 1 | | **6342370** |
| **US 3 K 120 FT** | 1200 | 2 | 5 | | 1 | | **6342372** |



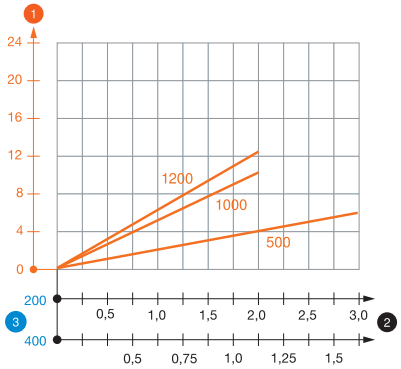
For fastening to horizontal concrete ceilings and steel girders. For bracket widths of 400 mm or more, or if the bracket is mounted at the end of a suspended support, we recommend the use of the spacer, type DSK 25.

Suspended support (U profile) of dimensions 50 x 30 mm with welded head plate.




## Load

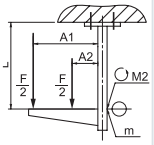
### Load diagram, U support, type US 3 K




1 Bending of the end of the suspended support at permitted bracket load
2 Permitted bracket load in kN without man load
3 Bracket length in mm
— Load curves with support lengths in mm

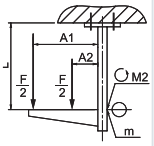
### Testing of the bending torque on the support with bracket

| Item on test | US 3 K 80 | US 3 K 120 |
|---|---|---|
| | AW 15 31 | AW 15 31 |
| Deformation measuring point m | | |
| A1 lever arm | 310 mm | 310 mm |
| A2 lever arm | 10 mm | 10 mm |
| Length L | 500 mm | 1,000 mm |
| Force F | 0.947 kN | 0.790 kN |
| Bending torque M2 (SWL) | 180 Nm | 150 Nm |




### Testing of the bending torque on the support with bracket with spacer

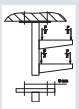
| Item on test | US 3 K 80 | US 3 K 120 |
|---|---|---|
| | AW 15 61 | AW 15 61 |
| Deformation measuring point m | | |
| A1 lever arm | 610 mm | 610 mm |
| A2 lever arm | 10 mm | 10 mm |
| Length L | 500 mm | 1,000 mm |
| Force F | 0.850 kN | 0.850 kN |
| Bending torque M2 (SWL) | 290 Nm | 290 Nm |




According to IEC 61537, Chapter 10.8.2.3, without spacer

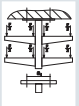
### Characteristic anchor load values for US 3 K suspended support

**Single-sided load**



| Anchor type | Max. load [kN] Bracket width [mm] 110% | 210 | 310 | 410 |
|---|---|---|---|---|
| BZ-U 8-10-21/75 | 2,18 | 1,59 | 1,25 | 1,02 |
| BZ3 10x90/0-30 | 3,05 | 2,00 | 1,49 | 1,18 |

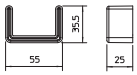
**Double-sided load**



| Anchor type | Max. load [kN] Bracket width [mm] 110% | 210 | 310 | 410 |
|---|---|---|---|---|
| BZ-U 8-10-21/75 | 4,54 | 3,78 | 3,21 | 1,50 |
| BZ3 10x90/0-30 | 7,17 | 5,96 | 5,07 | 4,50 |

Max. total load F = cable weight + cable tray + bracket + suspended support.
The tabular values for double-sided loads take the available axis spacing ai = 10 cm into account.
The stated values are based on uncracked concrete of compressive strength C20/25. Please comply with the installation conditions of ETA(anchors).

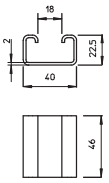
## Protective cap




| Type | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **US 3 KS OR** | Pastel orange | 20 | **6338458** |

Protective cap to cover the ends of US 3 supports.

## DSK 25 spacer

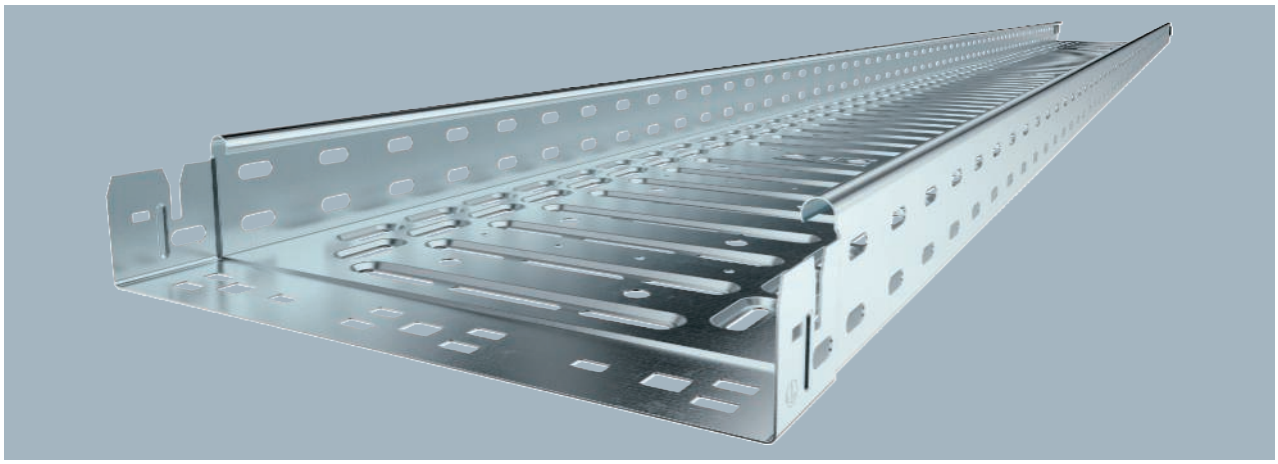



| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **DSK 25 FT** | 20 | **6416446** |

Spacer for use in US 3 supports. The spacer increases the stability of the U-profile and prevents deformation of the support when tightening continuous hexagonal bolts.

St FS

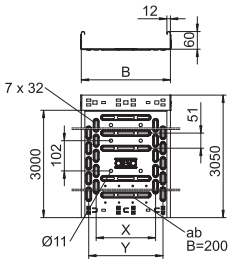
# Cable tray RKS-Magic® 60



Cable tray with integrated quick fastening system. The usable length of the cable tray is 3,000 mm.
The cable tray has continuous side perforations of 7 x 20 mm for the installation of additional connection and mounting components.
The perforation for direct threaded rod suspension has a diameter of 11 mm.

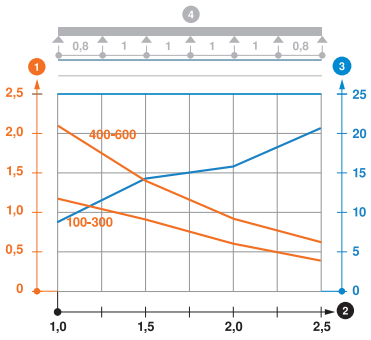
| Type | Width mm | Metal thickness mm | BS | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|---|
| **RKSM 610 FS** | 100 | 0.75 | | 3 | | **6047611** |
| **RKSM 620 FS** | 200 | 0.75 | | 3 | | **6047638** |
| **RKSM 630 FS** | 300 | 0.75 | | 3 | | **6047654** |
| **RKSM 640 FS** | 400 | 0.90 | | 3 | | **6047689** |
| **RKSM 650 FS** | 500 | 0.90 | | 3 | | **6047719** |
| **RKSM 660 FS** | 600 | 0.90 | | 3 | | **6047735** |

## Dimensions




| Type | Length mm | Dim. B mm | Usable cross-section cm² | Dim. x mm | Dimension y mm |
|---|---|---|---|---|---|
| RKSM 610 FS | 3050 | 100 | 58 | – | 50 |
| RKSM 620 FS | 3050 | 200 | 118 | 100 | 150 |
| RKSM 630 FS | 3050 | 300 | 178 | 200 | 250 |
| RKSM 640 FS | 3050 | 400 | 238 | 300 | 350 |
| RKSM 650 FS | 3050 | 500 | 298 | 400 | 450 |
| RKSM 660 FS | 3050 | 600 | 358 | 450 | 550 |

## Load



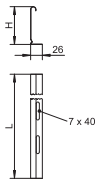

| | 1.0 m kN/m | 1.5 m kN/m | 2.0 m kN/m | 2.5 m kN/m | NEMA load class |
|---|---|---|---|---|---|
| **RKSM 610 FS** | 1.2 | 0.9 | 0.6 | 0.4 | 8AA |
| **RKSM 620 FS** | 1.2 | 1 | 0.55 | 0.4 | 8AA |
| **RKSM 630 FS** | 1.2 | 1 | 0.55 | 0.4 | 8AA |
| **RKSM 640 FS** | 2.1 | 1.35 | 0.8 | 0.6 | 8AA |
| **RKSM 650 FS** | 2.1 | 1.35 | 0.8 | 0.6 | 8AA |
| **RKSM 660 FS** | 2.1 | 1.4 | 0.8 | 0.6 | 8AA |

**Load diagram, cable tray, type RKSM 60**

1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm
— Strut bend curve according to support width

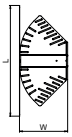
## Barrier strip 45




| Type | Dim. H mm | Metal thick-ness mm | Dim. L mm | Min. order-ing quan-tity m | Item no. |
|---|---|---|---|---|---|
| **TSG 45 DD** | 45 | 0.75 | 3000 | 3 | **6062321** |

Barrier strip for separation of cables of different voltages or functions.

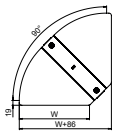
## Bend, angle-adjustable, 60




| Type | Side height mm | Dim. B mm | Dim. L mm | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|---|---|---|
| **RB W 610 FT** | 60 | 100 | 364 | 1 | **6037120** |
| **RB W 620 FT** | 60 | 200 | 522 | 1 | **6037124** |
| **RB W 630 FT** | 60 | 300 | 678 | 1 | **6037126** |
| **RB W 640 FT** | 60 | 400 | 834 | 1 | **6037128** |

Angle-adjustable bend for the creation of a horizontal branch, fitting for lock and screw-on cable trays of side height 60 mm. Adjustable angle 0–90°. Screwless mounting with double clamps or screw connection with FRS truss-head screws and M6 combination nuts. Can be used indoors and outdoors. Fastening material must be ordered separately.

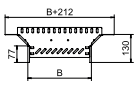
## Cover for angle-adjustable bend




| Type | Dim. B mm | Metal thick-ness mm | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|---|---|
| **RBD W 100 DD** | 100 | 0.75 | 1 | **6037540** |
| **RBD W 200 DD** | 200 | 0.75 | 1 | **6037544** |
| **RBD W 300 DD** | 300 | 0.75 | 1 | **6037546** |
| **RBD W 400 DD** | 400 | 1.00 | 1 | **6037548** |

Cover for angle-adjustable bend fitting for lockable and screw-on cable trays in indoor and outdoor areas, to protect cables against damage and soiling. Fastening with pre-mounted sash locks and through attachment of the section cover. Suitable for all side heights.

## Mounting/branch piece 60



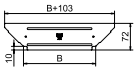

| Type | Side height mm | Dim. B mm | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|---|---|
| **RAA 610 FT** | 60 | 100 | 1 | **6042211** |
| **RAA 620 FT** | 60 | 200 | 1 | **6042215** |
| **RAA 630 FT** | 60 | 300 | 1 | **6042217** |
| **RAA 640 FT** | 60 | 400 | 1 | **6042219** |

Add-on tee for the creation of a horizontal branch or cross-over, fitting for lock and screw-on cable trays of side height 60 mm. Screwless mounting with double clamps or screw connection with FRS truss-head screws and M6 combination nuts. Can be used indoors and outdoors. Fastening material must be ordered separately.

St DD

## Cover, add-on tee

| Type | Dim. B mm | Metal thick-ness mm | Min. order-ing quan-tity Piece | Item no. |
|---|---|---|---|---|
| **RAAD 100 DD** | 100 | 0.75 | 1 | **6042431** |
| **RAAD 200 DD** | 200 | 0.75 | 1 | **6042435** |
| **RAAD 300 DD** | 300 | 0.75 | 1 | **6042437** |
| **RAAD 400 DD** | 400 | 1.00 | 1 | **6042439** |




Cover for add-on tee fitting for lockable and screw-on cable trays in indoor and outdoor areas, to protect cables against damage and soiling. Fastening through attachment of the section cover. Suitable for all side heights.

The cover can be used with fittings of all side heights.

## Cable ladder LG 60, 3 m VS

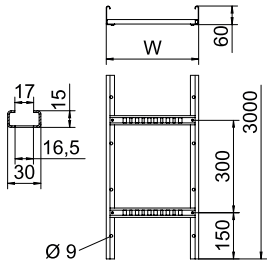
| Type | Width mm | BS | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **LG 620 VS 3 FT** | 200 | | 3 | **6208562** |
| **LG 630 VS 3 FT** | 300 | | 3 | **6208566** |
| **LG 640 VS 3 FT** | 400 | | 3 | **6208570** |
| **LG 650 VS 3 FT** | 500 | | 3 | **6208574** |
| **LG 660 VS 3 FT** | 600 | | 3 | **6208578** |

Cable ladder with perforated side rail of side height 60 mm with riveted C profile frames, open in an upwards direction (VS version).

The cable ladder is shipped folded up.
Cables can be mounted with the matching clamp clip, type 2056. The cable ladders in the widths 200 mm to 400 mm are also approved for vertical mounting as a vertical ladder in systems that guarantee the maintenance of electrical functionality according to DIN 4102 Part 12. Cables can be mounted with the clamp clip approved for the maintenance of electrical function, type 2056 M.

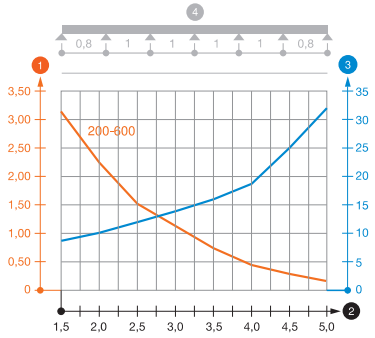
| Type | Length mm | Dim. B mm | Rail thickness mm | Usable cross-section $cm^2$ | Rung spacing mm |
|---|---|---|---|---|---|
| LG 620 VS 3 FT | 3000 | 200 | 1.5 | 98 | 300 |
| LG 630 VS 3 FT | 3000 | 300 | 1.5 | 148 | 300 |
| LG 640 VS 3 FT | 3000 | 400 | 1.5 | 198 | 300 |
| LG 650 VS 3 FT | 3000 | 500 | 1.5 | 248 | 300 |
| LG 660 VS 3 FT | 3000 | 600 | 1.5 | 298 | 300 |

### Dimensions




| | 1.5 m kN/m | 2.0 m kN/m | 2.5 m kN/m | 3.0 m kN/m | 4.0 m kN/m | 4.5 m kN/m | 5.0 m kN/m |
|---|---|---|---|---|---|---|---|
| **LG 620 VS 3 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 630 VS 3 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 640 VS 3 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 650 VS 3 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |
| **LG 660 VS 3 FT** | 3.1 | 2.25 | 1.5 | 1.1 | 0.45 | 0.3 | 0.15 |

### Load




### Load diagram, LG 60 VS

1. Permitted cable tray/ladder load in kN/m without man load
2. Support width in m
3. Rail bend in mm at permitted kN/m
4. Load scheme during testing

— Load curve with cable tray/ladder width in mm

— Strut bend curve according to support width

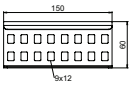


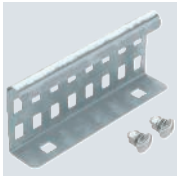
Always indicate the item number when ordering.

St FT

## Straight connector 60

| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **LVG 60 FT** | 60 | 10 | **6208843** |



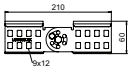
Straight connector as external connector to connect cable ladders and fittings with a side height of 60 mm and continuous rail perforation.

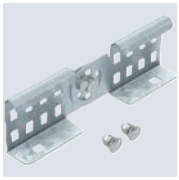
The bolt fastening ensures the continuity of the equipotential bonding.

St FT

## Adjustable connector 60

| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **LGVG 60 FT** | 60 | 10 | **6208944** |



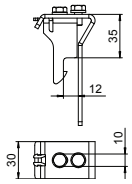
Adjustable connector as external connector to join cable ladders and fittings with a side height of 60 mm and continuous rail perforation. Angle can be adjusted vertically.

The bolt fastening ensures the continuity of the equipotential bonding.

A2 2B

## Spacer for cover

| Type | Side height mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **AH 35 A2** | 35 | 8 | **6065475** |

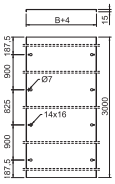


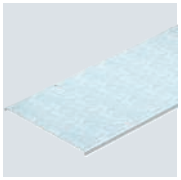

Spacers for stand-off cover mounting on cable trays and cable ladders. Space height 35 mm, stainless steel 1.4301.

St FT

## Cover for stand-off mounting

| Type | Width mm | Metal thickness mm | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| **DRL FAM 230 FT** | 230 | 1.50 | 3000 | 3 | **6051222** |
| **DRL FAM 330 FT** | 330 | 1.50 | 3000 | 3 | **6051224** |
| **DRL FAM 430 FT** | 430 | 1.50 | 3000 | 3 | **6051226** |
| **DRL FAM 530 FT** | 530 | 1.50 | 3000 | 3 | **6051228** |
| **DRL FAM 630 FT** | 630 | 1.50 | 3000 | 3 | **6051230** |



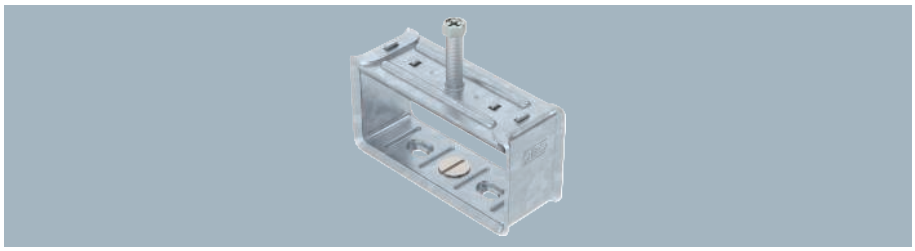



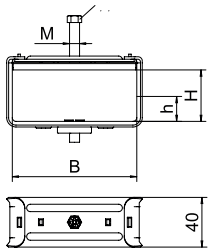
Cover for stand-off mounting. Not suitable for the vertical ladders SLM and SLS.

Spacers must ordered separately for every 3 m under article number 6065475 for cable trays and cable ladders as well as under article number 6065477 for wide span systems.

When using covers outdoors, additional measures against the influence of wind must be taken.

## Bundle clip






| Type | Height x Width mm | Dim. h mm | Dim. H mm | Dim. B mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|
| **2056 B 35 FT** | 35 x 50 | 20 | 35 | 50 | 100 | **1194054** |
| **2056 B 40 FT** | 40 x 100 | 15 | 40 | 100 | 50 | **1194046** |
| **2056 B 80 FT** | 80 x 100 | 55 | 80 | 100 | 25 | **1194089** |

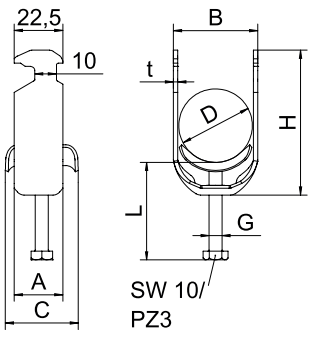
Clip and bolt made of hot-dip galvanised steel, countersunk head bolt made of rustproof stainless steel, slide nut made of electrogalvanised stainless steel.

## Clamp clip 2056 H-foot, 1-fold, metal pressure sleeve

| Type | Clamping range D mm | BS | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **BS-H1-M-12 FT** | 8-12 | | 100 | **1186002** |
| **BS-H1-M-16 FT** | 12-16 | | 100 | **1186009** |
| **BS-H1-M-22 FT** | 16-22 | | 100 | **1186016** |
| **BS-H1-M-28 FT** | 22-28 | | 100 | **1186022** |
| **BS-H1-M-34 FT** | 28-34 | | 100 | **1186029** |
| **BS-H1-M-40 FT** | 34-40 | | 100 | **1186036** |
| **BS-H1-M-46 FT** | 40-46 | | 100 | **1186042** |
| **BS-H1-M-52 FT** | 46-52 | | 100 | **1186049** |
| **BS-H1-M-58 FT** | 52-58 | | 100 | **1186056** |
| **BS-H1-M-64 FT** | 58-64 | | 100 | **1186062** |
| **BS-H1-M-70 FT** | 64-70 | | 50 | **1186069** |
| **BS-H1-M-76 FT** | 70-76 | | 25 | **1186076** |
| **BS-H1-M-82 FT** | 76-82 | | 25 | **1186082** |
| **BS-H1-M-90 FT** | 82-90 | | 25 | **1186089** |
| **BS-H1-M-100 FT** | 90-100 | | 25 | **1186097** |

Clamp clip with hammerhead foot, metal pressure sleeve with rounded edges to protect the cable. For vertical and horizontal mounting of 1 single cable on a C-profile rail. For a slot width 16–17 mm. With 1-start screw thread on pressure sleeve, universal hexagonal screw head WAF10, with slot and cross recess. Suitable for assembly indoors and outdoors. The counter-sleeve must be ordered separately.

### Dimensions




| Type | Clamping range D mm | Dim. A mm | Dim. B mm | Dim. C mm | Dim. G | Dim. t mm | Dim. H mm | Dim. L mm | Max. torque Nm |
|---|---|---|---|---|---|---|---|---|---|
| BS-H1-M-12 FT | 8-12 | 22.5 | 17 | 28 | M6 | 1.5 | 42 | 34 | 3 |
| BS-H1-M-16 FT | 12-16 | 22.5 | 20 | 28 | M6 | 1.5 | 46 | 34 | 3 |
| BS-H1-M-22 FT | 16-22 | 22.5 | 27 | 28 | M6 | 1.5 | 52 | 34 | 3 |
| BS-H1-M-28 FT | 22-28 | 22.5 | 33 | 28 | M6 | 2 | 59 | 34 | 3 |
| BS-H1-M-34 FT | 28-34 | 22.5 | 39 | 34 | M6 | 2 | 67 | 46 | 3 |
| BS-H1-M-40 FT | 34-40 | 22.5 | 45 | 33 | M6 | 2 | 74 | 46 | 3 |
| BS-H1-M-46 FT | 40-46 | 25 | 51 | 33 | M8 | 2 | 82 | 43 | 5 |
| BS-H1-M-52 FT | 46-52 | 25 | 57 | 33 | M8 | 2 | 89 | 43 | 5 |
| BS-H1-M-58 FT | 52-58 | 25 | 64 | 33 | M8 | 2.5 | 96 | 43 | 5 |
| BS-H1-M-64 FT | 58-64 | 25 | 70 | 33 | M8 | 2.5 | 102 | 43 | 5 |
| BS-H1-M-70 FT | 64-70 | 25 | 76 | 33 | M8 | 2.5 | 109 | 43 | 5 |
| BS-H1-M-76 FT | 70-76 | 25 | 82 | 37 | M8 | 2.5 | 115 | 55 | 5 |
| BS-H1-M-82 FT | 76-82 | 25 | 88 | 37 | M8 | 2.5 | 122 | 55 | 5 |
| BS-H1-M-90 FT | 82-90 | 27 | 97 | 38 | M8 | 3 | 132 | 55 | 5 |
| BS-H1-M-100 FT | 90-100 | 27 | 107 | 38 | M8 | 3 | 143 | 55 | 5 |



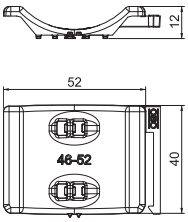
Always indicate the item number when ordering.

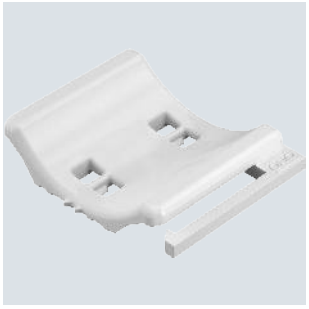
PP

F N H U W HALOGEN FREE

## Universal counter-trough, plastic

| Type | Clamping range D mm | Dim. L mm | Dim. B mm | Dim. H mm | Colour | Shipping box Piece | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|---|---|
| **2058UW 12 LGR** | 8-12 | 37 | 18.5 | 5.8 | Light grey | 1500 | 100 | **1198012** |
| **2058UW 16 LGR** | 12-16 | 37 | 21.5 | 5.8 | Light grey | 1600 | 100 | **1198016** |
| **2058UW 22 LGR** | 16-22 | 37 | 27.5 | 6.8 | Light grey | 1500 | 100 | **1198022** |
| **2058UW 28 LGR** | 22-28 | 37 | 33.5 | 8.3 | Light grey | 1200 | 100 | **1198028** |
| **2058UW 34 LGR** | 28-34 | 37 | 45.5 | 9.8 | Light grey | 1200 | 100 | **1198034** |
| **2058UW 40 LGR** | 34-40 | 37 | 45.5 | 10.8 | Light grey | 600 | 50 | **1198040** |
| **2058UW 46 LGR** | 40-46 | 40 | 51.5 | 11.8 | Light grey | 600 | 50 | **1198046** |
| **2058UW 52 LGR** | 46-52 | 40 | 57.5 | 11.8 | Light grey | 600 | 50 | **1198052** |
| **2058UW 58 LGR** | 52-58 | 40 | 63.5 | 11.8 | Light grey | 600 | 50 | **1198058** |
| **2058UW 64 LGR** | 58-64 | 40 | 69.5 | 11.8 | Light grey | 600 | 50 | **1198064** |
| **2058UW 70 LGR** | 64-70 | 40 | 75.5 | 12.3 | Light grey | 300 | 25 | **1198070** |
| **2058UW 76 LGR** | 70-76 | 40 | 81.5 | 12.3 | Light grey | 300 | 25 | **1198076** |
| **2058UW 82 LGR** | 76-82 | 40 | 87.5 | 12.3 | Light grey | 300 | 25 | **1198082** |
| **2058UW 90 LGR** | 82-90 | 40 | 96 | 12.8 | Light grey | 300 | 25 | **1198090** |
| **2058UW 100 LGR** | 90-100 | 40 | 106 | 12.8 | Light grey | 300 | 25 | **1198100** |



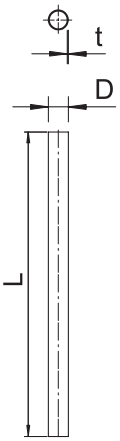
Regardless of the type of rail, the counter-trough can be used by applying it onto one side of the clamp clip. Due to an intelligent contour on the backside, the counter-trough can be combined to a double trough. Retrofitting possible without the need to dismantle.

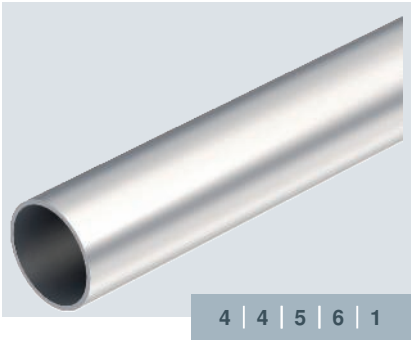
Alu

CE UK CA DVE

## Aluminium pipe, without thread

| Type | Dim. D mm | Dim. L mm | Dim. t mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| **S16W ALU** | 16 | 3000 | 1.2 | 30 | **2046002** |
| **S20W ALU** | 20 | 3000 | 1.2 | 30 | **2046003** |
| **S25W ALU** | 25 | 3000 | 1.3 | 30 | **2046004** |
| **S32W ALU** | 32 | 3000 | 1.3 | 30 | **2046005** |
| **S40W ALU** | 40 | 3000 | 1.4 | 15 | **2046006** |
| **S50W ALU** | 50 | 3000 | 1.4 | 15 | **2046007** |
| **S63W ALU** | 63 | 3000 | 1.7 | 15 | **2046008** |



4 | 4 | 5 | 6 | 1

Electrical installation pipe without threaded ends to EN 61386-1 for mechanical protection of cables. With burr-free inner wall.

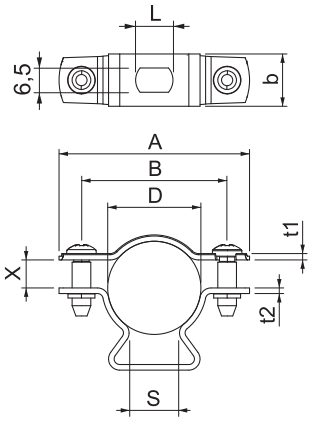
## Spacer clip 733

Alu

| Type | Clamping range D mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **ASL 733 17 ALU** | 14-17 | 25 | **1362812** |
| **ASL 733 20 ALU** | 17-20 | 25 | **1362814** |
| **ASL 733 25 ALU** | 20-25 | 25 | **1362818** |
| **ASL 733 36 ALU** | 30-36 | 20 | **1362826** |
| **ASL 733 44 ALU** | 36-44 | 20 | **1362830** |
| **ASL 733 53 ALU** | 44-53 | 20 | **1362834** |
| **ASL 733 63 ALU** | 53-63 | 20 | **1362838** |

Spacer clip for the installation of pipes and cables on walls, ceilings and floors. With self-locking upper part. Fastening via slot.

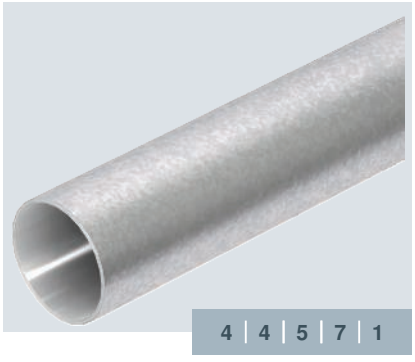
**Dimensions**




| Type | Dim. A mm | Dim. B mm | Dim. x mm | Dim. t1 mm | Dim. t2 mm | Dim. L mm | Dim. b mm | Dim. s mm |
|---|---|---|---|---|---|---|---|---|
| ASL 733 17 ALU | 44 | 32 | 4.5 | 1.25 | 1.5 | 10 | 14 | 9.5 |
| ASL 733 20 ALU | 47 | 35 | 4.5 | 1.25 | 1.5 | 10 | 14 | 12 |
| ASL 733 25 ALU | 51 | 39 | 7.5 | 1.25 | 1.5 | 10 | 14 | 13.5 |
| ASL 733 36 ALU | 65 | 51 | 9 | 1.5 | 1.5 | 10 | 16 | 20 |
| ASL 733 44 ALU | 73 | 59 | 12 | 1.5 | 1.5 | 10 | 16 | 24 |
| ASL 733 53 ALU | 84 | 70 | 13.5 | 1.5 | 2 | 10 | 16 | 29.5 |
| ASL 733 63 ALU | 94 | 80 | 15 | 1.5 | 2 | 10 | 16 | 35.3 |

## Hot-dip galvanised steel pipe, without thread

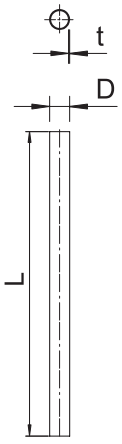
St FT E30 E90



4 | 4 | 5 | 7 | 1

Electrical installation pipe without threaded ends according to EN 61386-1 for mechanical protection of cables. With burr-free inner wall. Corrosion protection class 4 (high).

| Type | Dim. D mm | Dim. L mm | Dim. t mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|---|
| **S16W FT** | 16 | 3000 | 1 | 30 | **2046593** |
| **S20W FT** | 20 | 3000 | 1 | 30 | **2046594** |
| **S25W FT** | 25 | 3000 | 1.2 | 30 | **2046595** |
| **S32W FT** | 32 | 3000 | 1.2 | 21 | **2046596** |
| **S40W FT** | 40 | 3000 | 1.2 | 15 | **2046597** |
| **S50W FT** | 50 | 3000 | 1.2 | 15 | **2046598** |
| **S63W FT** | 63 | 3000 | 1.2 | 9 | **2046599** |






Always indicate the item number when ordering.

St FT

E30 E60 E90

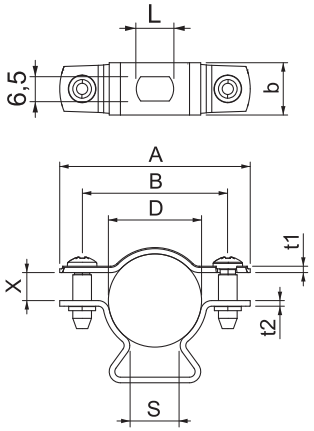
## Spacer clip 733

| Type | Clamping range D mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **ASL 733 17 FT** | 14-17 | 25 | **1362712** |
| **ASL 733 20 FT** | 17-20 | 25 | **1362714** |
| **ASL 733 25 FT** | 20-25 | 25 | **1362718** |
| **ASL 733 36 FT** | 30-36 | 20 | **1362726** |
| **ASL 733 44 FT** | 36-44 | 20 | **1362730** |
| **ASL 733 53 FT** | 44-53 | 20 | **1362734** |
| **ASL 733 63 FT** | 53-63 | 20 | **1362738** |

Spacer clip for the installation of pipes and cables on walls, ceilings and floors. With self-locking cover. Fastening via slot.
Approved for the maintenance of electrical function according to DIN 4102 Part 12, maintenance of electrical function classes E 30 to E 90.

| Type | Dim. A mm | Dim. B mm | Dim. x mm | Dim. t1 mm | Dim. t2 mm | Dim. L mm | Dim. b mm | Dim. s mm |
|---|---|---|---|---|---|---|---|---|
| ASL 733 17 FT | 44 | 32 | 4.5 | 1.25 | 1.5 | 10 | 14 | 9.5 |
| ASL 733 20 FT | 47 | 35 | 4.5 | 1.25 | 1.5 | 10 | 14 | 12 |
| ASL 733 25 FT | 51 | 39 | 7.5 | 1.25 | 1.5 | 10 | 14 | 13.5 |
| ASL 733 36 FT | 65 | 51 | 9 | 1.5 | 1.5 | 10 | 16 | 20 |
| ASL 733 44 FT | 73 | 59 | 12 | 1.5 | 1.5 | 10 | 16 | 24 |
| ASL 733 53 FT | 84 | 70 | 13.5 | 1.5 | 2 | 10 | 16 | 29.5 |
| ASL 733 63 FT | 94 | 80 | 15 | 1.5 | 2 | 10 | 16 | 35.3 |

**Dimensions**

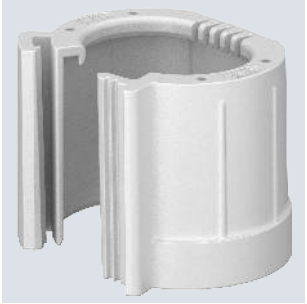



PE

M HALOGEN FREE UV RESISTANT

## Pipe end cap, splittable, metric, light grey

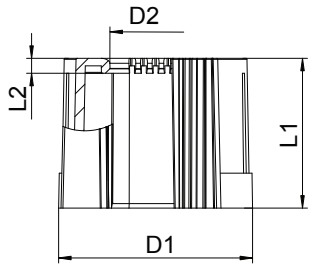
| Type | Size | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **129 TB M16** | M16 | Light grey | 50 | **2047812** |
| **129 TB M20** | M20 | Light grey | 50 | **2047831** |
| **129 TB M25** | M25 | Light grey | 50 | **2047839** |
| **129 TB M32** | M32 | Light grey | 50 | **2047855** |
| **129 TB M40** | M40 | Light grey | 30 | **2047863** |
| **129 TB M50** | M50 | Light grey | 30 | **2047890** |
| **129 TB M63** | M63 | Light grey | 20 | **2047898** |



Separable pipe end cap to slot onto metric electrical installation pipes.
The separable pipe end cap can be used for repairs on existing installations according to regulations. It is not necessary to disconnect the cables, allowing quick mounting.

| Type | Dim. D1 mm | Dim. D2 mm | Dim. L1 mm | Dim. L2 mm |
|---|---|---|---|---|
| 129 TB M16 | 20 | 10 | 30 | 3 |
| 129 TB M20 | 24 | 13.4 | 30 | 3 |
| 129 TB M25 | 30 | 18.4 | 30 | 3 |
| 129 TB M32 | 36 | 25.4 | 30 | 3 |
| 129 TB M40 | 44 | 33.4 | 30 | 3 |
| 129 TB M50 | 53 | 43 | 30 | 3 |
| 129 TB M63 | 67 | 56 | 30 | 3 |

**Dimensions**



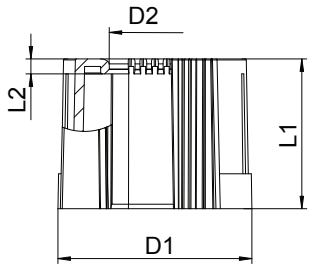
## Pipe end cap, splittable, metric, black

PE
M HALOGEN FREE UV RESISTANT

| Type | Size | Colour | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **129 TB M16 SW** | M16 | Black | 50 | | **2047936** |
| **129 TB M20 SW** | M20 | Black | 50 | | **2047944** |
| **129 TB M25 SW** | M25 | Black | 50 | | **2047952** |
| **129 TB M32 SW** | M32 | Black | 50 | | **2047971** |
| **129 TB M40 SW** | M40 | Black | 30 | | **2047979** |
| **129 TB M50 SW** | M50 | Black | 30 | | **2047987** |
| **129 TB M63 SW** | M63 | Black | 20 | | **2047995** |

Separable pipe end cap to slot onto metric electrical installation pipes.
The separable pipe end cap can be used for repairs on existing installations according to regulations. It is not necessary to disconnect the cables, allowing quick mounting.

### Dimensions




| Type | Dim. D1 mm | Dim. D2 mm | Dim. L1 mm | Dim. L2 mm |
|---|---|---|---|---|
| 129 TB M16 SW | 20 | 10 | 30 | 3 |
| 129 TB M20 SW | 24 | 13.4 | 30 | 3 |
| 129 TB M25 SW | 30 | 18.4 | 30 | 3 |
| 129 TB M32 SW | 36 | 25.4 | 30 | 3 |
| 129 TB M40 SW | 44 | 33.4 | 30 | 3 |
| 129 TB M50 SW | 53 | 43 | 30 | 3 |
| 129 TB M63 SW | 67 | 56 | 30 | 3 |

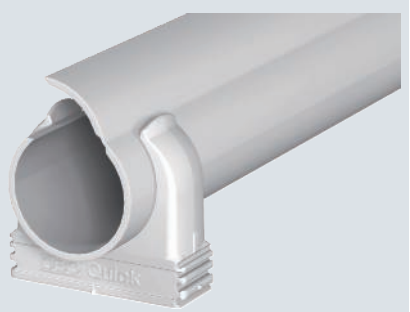


Always indicate the item number when ordering.

PVC

## Set of Quick clips and Quick-Pipe® pipes

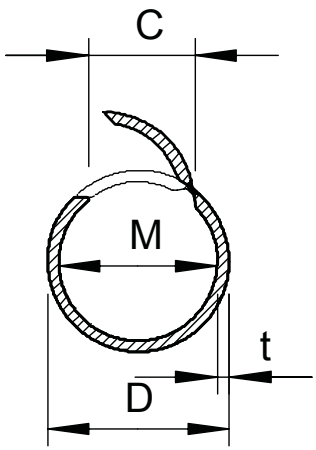
| Type | Size | Colour | Set consisting of | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **2954 M16 LGR** | M16 | Light grey | 50 m Quick pipe and 156x OBO Quick clip | 1 | **2154501** |
| **2954 M20 LGR** | M20 | Light grey | 40 m Quick pipe and 120x OBO Quick clip | 1 | **2154528** |
| **2954 M25 LGR** | M25 | Light grey | 30 m Quick pipe and 96x OBO Quick clip | 1 | **2154536** |
| **2954 M32 LGR** | M32 | Light grey | 20 m Quick pipe and 60x OBO Quick clip | 1 | **2154544** |



Set consisting of Quick-Pipe® electrical installation pipes and Quick clip surface-mounted clips. For surface-mounted routing of cables in interiors and protected outdoor areas. Universal fastening on wall and ceiling. Depending on diameter, the set comprises up to 50 m of pipe each of 2 metres in length and up to 156 Quick clips. Can be used in a temperature range of –25 to + 60 °C.

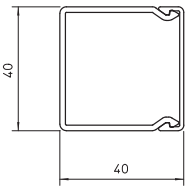
| Type | Dimension M mm | Dim. t mm | Dim. C mm | Dim. D mm |
|---|---|---|---|---|
| 2954 M16 LGR | 13.2 | 1.2 | 8,2 | 15.6 |
| 2954 M20 LGR | 17 | 1.5 | 10 | 20 |
| 2954 M25 LGR | 21.8 | 1.6 | 13,6 | 25 |
| 2954 M32 LGR | 28.6 | 1.7 | 17 | 32 |

**Dimensions**



## Trunking, type WDK 40040

PVC

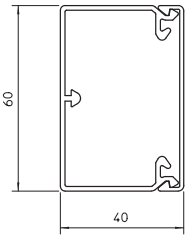



| Type | Colour | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **WDK40040RW** | Pure white | 2000 | 36 | **6191126** |

Trunking cover and base with base perforation.

## Trunking, type WDK 40060

PVC

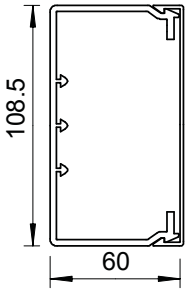



| Type | Colour | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **WDK40060RW** | Pure white | 2000 | 32 | **6191134** |

Trunking cover and base with base perforation.

## Trunking, type WDK 60110

PVC

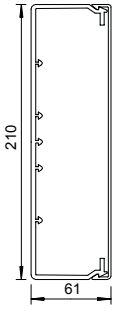



| Type | Colour | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **WDK60110RW** | Pure white | 2000 | 16 | **6191215** |

Trunking cover and base with base perforation.

## Trunking, type WDK 60210

PVC




| Type | Colour | Length mm | Min. ordering quantity m | Item no. |
|---|---|---|---|---|
| **WDK60210RW** | Pure white | 2000 | 8 | **6191266** |

Trunking cover and base with base perforation.



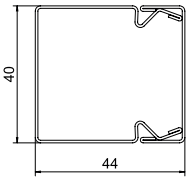
Always indicate the item number when ordering.

St FSK

## Cable duct, type LKM 40040

| Type | Colour | Length mm | Min. ordering quantity m | Pack m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|
| LKM40040RW | Pure white | 2000 | 2 | 2 | 132.600 | 6248497 |

Duct cover and base with base perforation.
Equipotential bonding is guaranteed between the cover and the base without any additional aids.

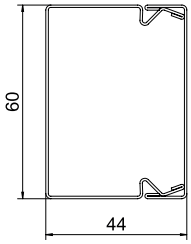



St FSK

## Cable duct, type LKM 40060

| Type | Colour | Length mm | Min. ordering quantity m | Pack m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|
| LKM40060RW | Pure white | 2000 | 2 | 2 | 157.300 | 6248519 |

Duct cover and base with base perforation.
Equipotential bonding is guaranteed between the cover and the base without any additional aids.

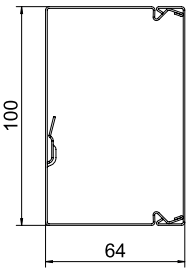



St FSK E90

## Cable duct, type LKM 60100

| Type | Colour | Length mm | Min. ordering quantity m | Pack m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|
| LKM60100RW | Pure white | 2000 | 2 | 2 | 230.200 | 6248624 |

Duct cover and base with base perforation. Equipotential bonding is guaranteed between the cover and the base without any additional aids. The LKM cable duct, type LKM 60100, has been tested for the maintenance of electrical function as a routing system according to DIN 4102 Part 12. Please note the cable types tested in the BSS fire protection systems division!

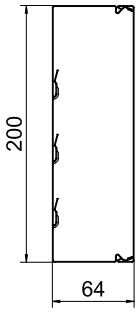



St FSK

## Cable trunking, type LKM 60200

| Type | Colour | Length mm | Min. ordering quantity m | Pack m | Weight kg/100 m | Item no. |
|---|---|---|---|---|---|---|
| LKM60200RW | Pure white | 2000 | 2 | 2 | 352.500 | 6248667 |

Trunking cover and base with base perforation.
Equipotential bonding is guaranteed between the cover and the base without any additional aids.




# Safe and efficient system operation with equipotential bonding

Equipotential bonding plays a key role in the safe operation of PV systems. After all, it equalises dangerous voltage differences between various conductive parts of the system. Various equipotential bonding rails are used for this, for example. This ensures optimal safety and functionality for your system – today and in the future.

# Equipotential bonding for photovoltaic systems

PV systems must always be equipped with equipotential bonding. This arises from the “Requirements for protection against electric shock” which are set out in the standard DIN VDE 0100-410 and E VDE 0100-712.

- Prevents electric shock
- Reduces the risk of fires and short-circuits
- Reduces electromagnetic interference

When it comes to equipotential bonding in PV systems, connection terminals are often used for the mounting frames and equipotential bonding rails, e.g. near the inverters. In a next step, the PV installation is connected to the building’s grounding system. This prevents dangerous voltage differences.

## Equipotential busbar for outside installation, metal base plate

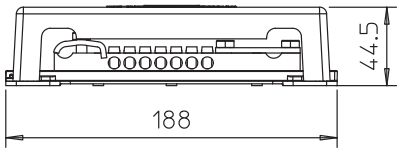
A2

| Type | Colour | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|
| **1809 AM** | Black | 188 | 52 | 44.5 | 1 | | **5015105** |

Equipotential busbar for equipotential bonding according to DIN VDE 0100-410/-540 and lightning protection equipotential bonding according to DIN VDE 0185-305

- Cover hood made of polystyrene
- Base plate made of steel, zinc-iron surface
- Colour: Black, UV-resistant
- Screws and crossbar made of VA
- Capable of carrying lightning current 100 kA (10/350)

Connection options:
- 7 single or multi-wire cables to 25 mm² or fine-wire cables to 16 mm²
- 1 round conductor Rd 8–10
- 1 flat strip to FL30 or round conductor Rd 8–10





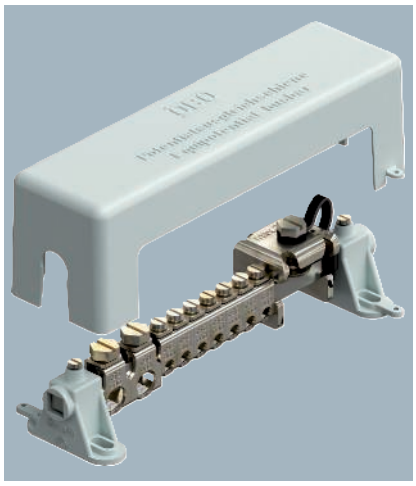


Always indicate the item number when ordering.

CuZn 37

## Equipotential busbar for indoors, VDE-tested

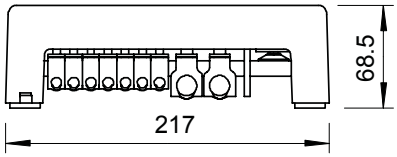
| Type | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **1801 VDE** | Grey | 1 | **5015650** |



Equipotential busbar for equipotential bonding according to DIN VDE 0100-410/-540 as well as lightning protection equipotential bonding according to DIN VDE 0185-305

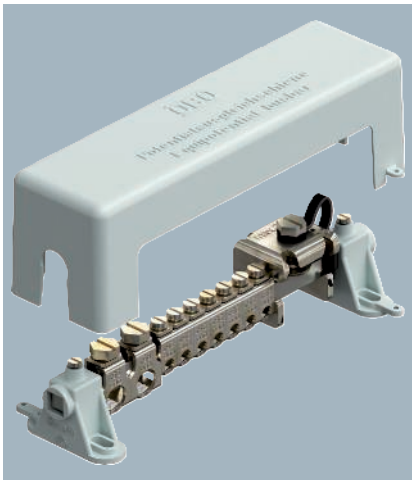
- With 10 x 10 mm clamping rail made of nickel-plated brass
- With contact-secure series terminals made of electrogalvanised steel
- Cover and rail stands made of grey polystyrene
- Sealable / labellable cover
- Lightning current carrying capacity 100 kA (10/350)
- Tension clamp with screw lock against self-loosening (e.g. required in industry)

Connection options:
- 12 single or multi-wire cables 2.5–25 mm² or fine-wire cables with wire end sleeve to 16 mm² (max. Ø 7 mm)
- 1 single or multi-wire cable 25–95 mm² or fine-wire cable with wire end sleeve to 70 mm² (max. Ø 13.5 mm)




## Equipotential busbar for indoors

CuZn 37

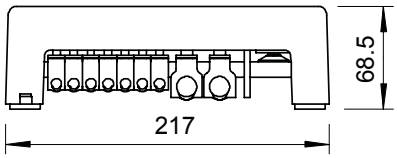


| Type | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **1801 12x25 1x95** | Grey | 1 | **5015683** |

Equipotential busbar for equipotential bonding according to DIN VDE 0100-410/-540 as well as lightning protection equipotential bonding according to DIN VDE 0185-305

- With 10 x 10 mm clamping rail made of nickel-plated brass
- With contact-secure series terminals made of electrogalvanised steel
- Cover and rail stands made of grey polystyrene
- Sealable / labellable cover
- Lightning current carrying capacity 100 kA (10/350)
- Tension clamp with screw lock against self-loosening (e.g. required in industry)

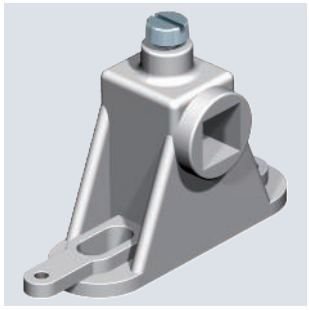
Connection options:
- 12 single or multi-wire cables 2.5–25 mm² or fine-wire cables with wire end sleeve to 16 mm² (max. Ø 7 mm)
- 1 single or multi-wire cable 25–95 mm² or fine-wire cable with wire end sleeve to 70 mm² (max. Ø 13.5 mm)

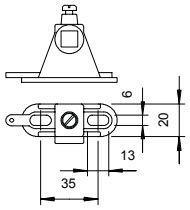




## Busbar stands for 1801 VDE

PS



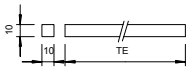



| Type | Colour | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **1801 SCH** | Grey | 10 | **5015715** |

- 2 rail stands required per 14 units
- With 6 x 13 mm slot

## Contact strip for 1801 VDE

CuZn 37




| Type | Length mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **1801 KL1** | 212 | 1 | **5015723** |
| **1801 KL2** | 430 | 1 | **5015804** |
| **1801 KL3** | 645 | 1 | **5015812** |

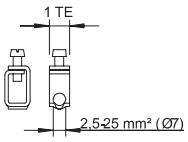
- 10 x 10 mm made of nickel-plated brass
- 1801 KL1: 14 subunits
- 1801 KL2: 28 subunits
- 1801 KL3: 42 subunits

St G

## Round conductor terminal to 25 mm² for 1801 VDE

| Type | Connection option | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **1801 RK25** | 2.5–25 mm² | 10 | | **5015758** |

- For single or multi-wire cables 2.5–25 mm²
- For fine-wire cables to 16 mm² (max. Ø 7 mm)
- 1 division unit
- Lightning current carrying capacity 100 kA (10/350)
- Electrogalvanised steel
- Tension clamp with screw lock against self-loosening (e.g. required in industry and in explosion-protected areas)

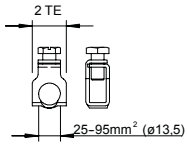



St G

## Round conductor terminal from 25 mm² for 1801 VDE

| Type | Connection option | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **1801 RK95** | 25–95 mm² | 10 | | **5015766** |

- For single or multi-wire cables 25–95 mm²
- For fine-wire cables to 70 mm² (max. Ø 13.5 mm)
- 2 division units
- Lightning current carrying capacity 100 kA (10/350)
- Electrogalvanised steel
- Tension clamp with screw lock against self-loosening (e.g. required in industry and in explosion-protected areas)

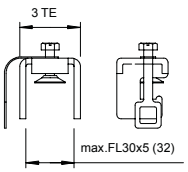


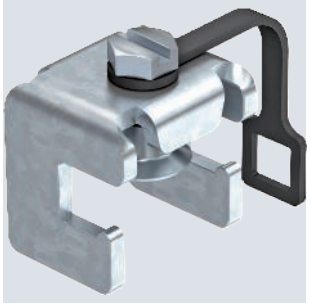

St G

## Flat conductor terminal to FL 30 for 1801 VDE

| Type | Connection option | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **1801 RK30** | FL 30 x 5 | 1 | | **5015731** |

- For flat conductors to FL 30 and thickness to 5 mm
- Captive design with plastic safety strap
- 3 division units
- Lightning current carrying capacity 100 kA (10/350)
- Electrogalvanised steel



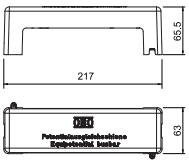



PS

## Cover hood for 1801 VDE

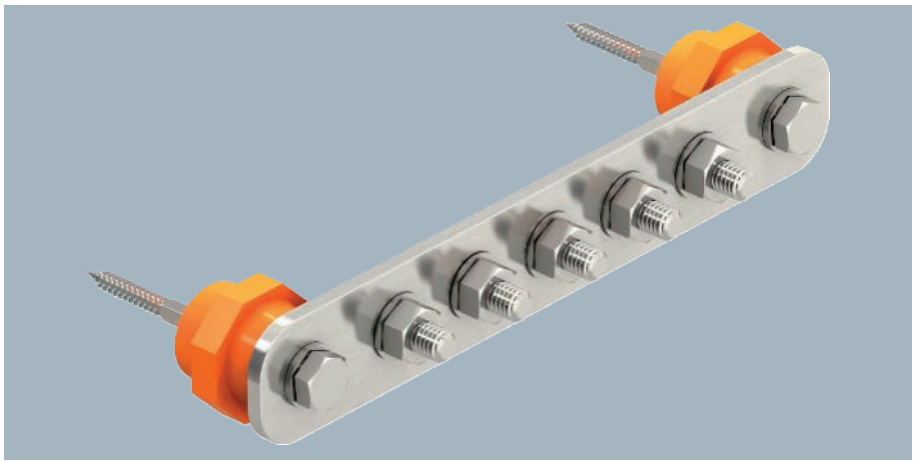
| Type | Colour | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|
| **1801 AH** | Grey | 217 | 63 | 65.5 | 1 | | **5015707** |

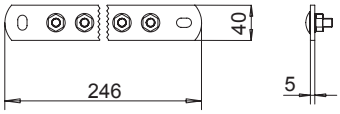
- 1 covering hood required per 14 division units
- Fastening to rail stands 1801 SCH
- Sealable




## Equipotential busbar BigBar for industrial application

A2





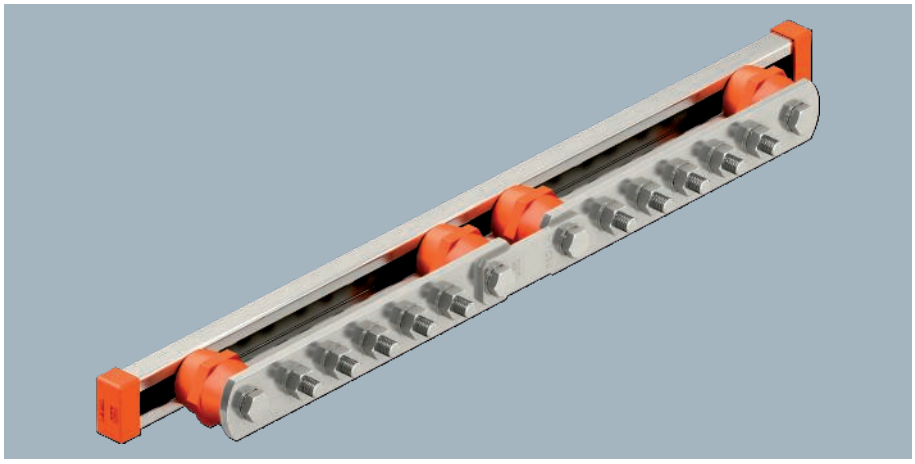

| Type | Number of connections | Width mm | Length mm | Height mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|
| **1802 5 VA** | 5 | 40 | 246 | 5 | 1 | | **5015854** |
| **1802 10 VA** | 10 | 40 | 408.5 | 5 | 1 | | **5015866** |

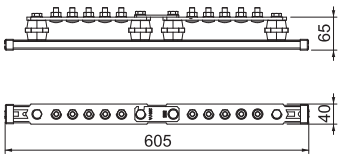
Main equipotential busbar for equipotential bonding to VDE 0100-410/-540, and also lightning protection equipotential bonding to VDE 0185-305 (IEC 62305)

- Insulation feet
- Quick and simple mounting of connection cables using lock bolts M10
- The high-grade stainless steel versions (V2A) are suitable for outdoor use
- Complete with anchors and bolts for wall mounting
- With spring washer (DIN 137) for bolt locking against loosening (e.g. required in industry and explosion-protected areas)

## Equipotential busbar for flexible wall mounting with separation point

A2






| Type | Number of connections | Width mm | Length mm | Height mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|
| **1802 DC 5+5 VA** | 10 | 40 | 605 | 85 | 1 | | **5015876** |

Main equipotential busbar for equipotential bonding to VDE 0100-410/-540, and also lightning protection equipotential bonding to VDE 0185-305 (IEC 62305)

- Insulation feet
- Quick and simple mounting of connection cables using lock bolts M10
- The high-grade stainless steel versions (V2A) are suitable for outdoor use
- Complete with anchors and bolts for wall mounting
- With spring washer (DIN 137) for bolt locking against loosening (e.g. required in industry and explosion-protected areas)

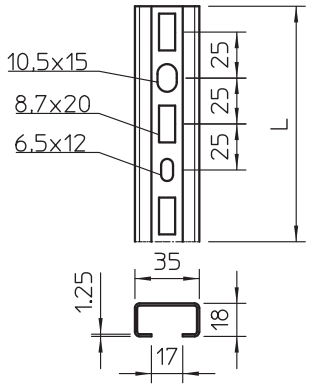


Always indicate the item number when ordering.

St FT

CE 17 H E30 E90

## CM3518 profile rail, slot 17 mm, perforated



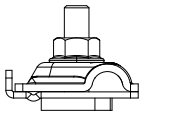

Central C profile rail for cable routing, in conjunction with clamp clips with a hammerhead foot. Can also be used as suspension construction for cable support systems.

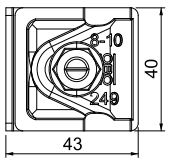
| Type | Length mm | Dimension W x H mm | Material thickness mm | Dim. L mm | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|---|---|
| **CML3518P2000FT** | 2000 | 35 x 18 | 1.25 | 2000 | 20 | | **1104570** |

A2

## Earthing terminal for PV mounting systems

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **249 PV10 6-50V2A** | 40 | 43 | 34 | 8 | | 8.460 | **5051520** |



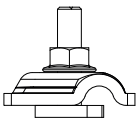


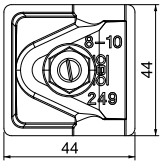

Pre-mounted earthing terminal for the inclusion of PV mounting systems in the equipotential bonding. Suitable for the inclusion of the PV mounting systems in an external lightning protection system.

- Lightning current-compatible up to 100 kA (10/350)
- Rapid mounting through integrated spring mechanism
- For round conductor fastening RD 8–10
- To fasten single/multi-wire cables: 6–50 mm²
- For profiles with 10 mm groove
- Meets the requirements of DIN EN 62561-1

## Earthing terminal for PV mounting systems

| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Weight kg/100 pc. | Item no. |
|---|---|---|---|---|---|---|---|
| **249 PV8-10 ALU** | 44 | 44 | 34 | 10 | | 4.500 | **5051526** |



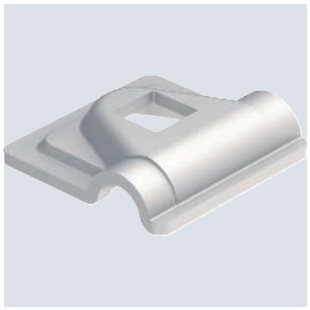


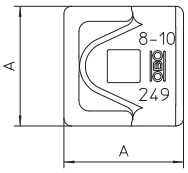

Earthing terminal for the inclusion of PV mounting systems in the equipotential bonding.

- For round conductor fastening RD 8–10
- For profiles with 10 mm groove

## Quick connector, upper part Rd 8–10 mm

Alu



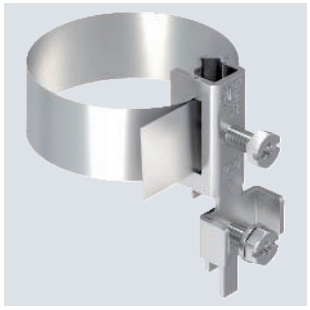


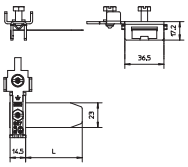

| Type | Fit mm | Dim. A mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **249 8-10 ALU-OT** | Rd 8-10 | 44 | 100 | **5311585** |

- For round conductor fastening Rd 8-10
- Suitable for M10 bolts

## Potential connection clamp for mounting on isFang

A2



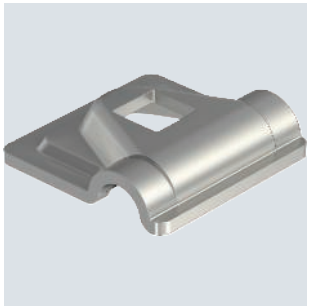


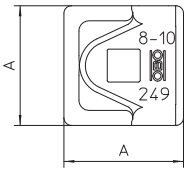

| Type | For pipe Ø inch | Dim. L mm | For pipe Ø mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **927 2 6-K** | 3/8-4 | 595 | 17.2 - 114 | 10 | **5057599** |

Potential connection for isCon® conductor for mounting on insulated air-termination rods of type isFang.

## Quick connector, upper part Rd 8–10 mm

A2



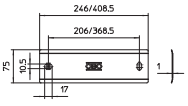



| Type | Fit mm | Dim. A mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **249 8-10 VA-OT** | Rd 8-10 | 40 | 100 | **5311554** |

- For round conductor Rd 8-10
- Suitable for M10 bolts

## Cover for BigBar equipotential busbar

A2




| Type | Number of connections | Min. ordering quantity Piece | Item no. |
|---|---|---|---|
| **1802 AH 5** | 5 | 1 | **5015880** |
| **1802 AH 10** | 10 | 1 | **5015884** |

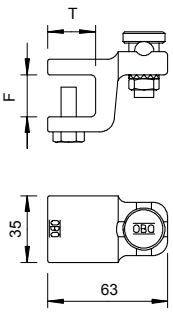
- Complete with all mounting components
- Labellable

SG FT

## Folding and construction clamp, 12 mm

| Type | Fit mm | Clamping range mm | Dim. T mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|
| **5004 DIN-FT 12** | Rd 8-10 | - 12 | 20 | N/50 | 10 | **5304407** |
| **5004 DIN-FT 20** | Rd 8-10 | 10 - 20 | 25 | N/50 | 10 | **5304504** |

- Flange thickness to 12 or 10–20 mm
- With pre-mounted fix contact clamping screw 5000
- 2 hexagonal bolts M8 x 20, bolts made of hot galvanised steel
- Terminal block made of malleable iron, hot galvanised
- Mounting of the round conductors either vertical or transverse to structure
- Corresponds to the requirements of DIN VDE 0185-305-3

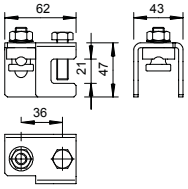



St FT

## Construction clamp to 20 mm

| Type | Fit mm | Clamping range mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **5010 20 FT** | Rd 8-10 | 4 - 20 | N/50 | 10 | **5304520** |

- Mounting of the round conductor possible vertically or transverse to construction
- For fastening to constructions up to a flange thickness of 20 mm
- Fastening to constructions using a hexagonal bolt M10
- Meets the requirements of VDE 0185-305 (IEC 62305)




# Surge protection for photovoltaic systems

## The complete range

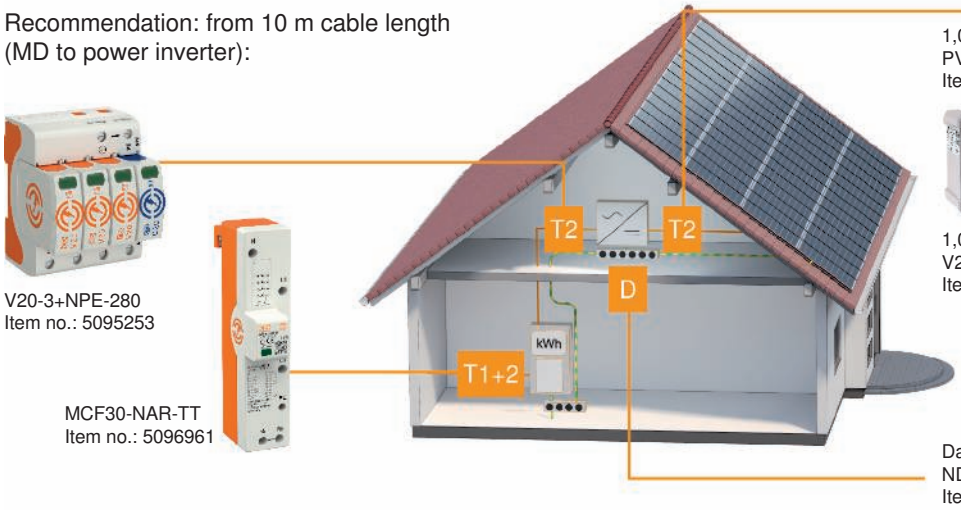
OBO's surge protection programme is set up in modules and offers solutions for almost all application cases. It includes:

- Type 1 and type 1+2 lightning current arrester, photovoltaics, DC side
- Type 2 surge protection, photovoltaics, DC side
- Type 1+2 lightning current arrester, AC side, 230/400 V
- Surge protection type 2, AC side, 230/400 V
- Surge protection for information and data technology

Particularly useful are the ready-made photovoltaic systems for the most common requirements, as they demand minimal installation only. Do you require special solutions, such as insulators or fuses?
Please get in touch with us.

# Buildings without lightning protection

Recommendation: from 10 m cable length
(MD to power inverter):




V20-3+NPE-280
Item no.: 5095253

MCF30-NAR-TT
Item no.: 5096961

1,000 V, per tracker
PVG- C1000K 200
Item no.: 5088435

1,000 V, 2 trackers
PVG-C1000K 110
Item no.: 5088415

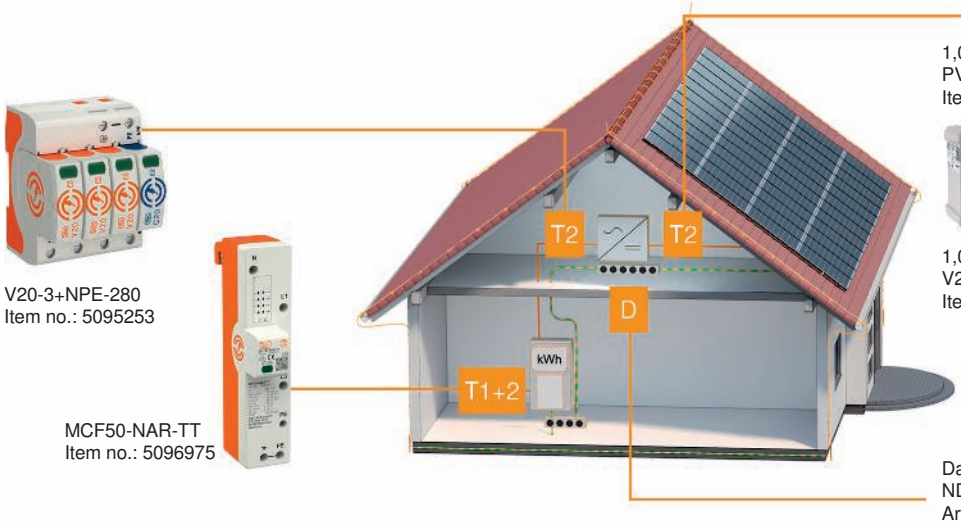
1,000 V, per tracker
V20-C 3-PH-1000
Item no.: 5094608

1,500 V, per tracker
PV-T2-1500
Item no.: 5094288

Data cable protection CAT6
ND-CAT6A/EA
Item no.: 5081800

# Building with lightning protection

with correctly maintained separation distance (LPC 3 or 4)




V20-3+NPE-280
Item no.: 5095253

MCF50-NAR-TT
Item no.: 5096975

1,000 V, per tracker
PVG- C1000K 200
Item no.: 5088435

1,000 V, 2 trackers
PVG-C1000K 110
Item no.: 5088415

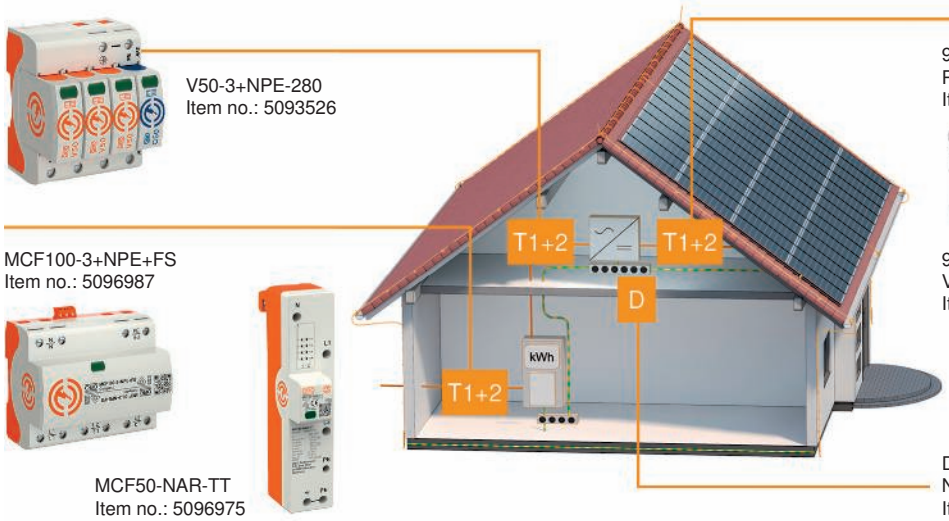
1,000 V, per tracker
V20-C 3-PH-1000
Item no.: 5094608

1,500 V, per tracker
PV-T2-1500
Item no.: 5094288

Data cable protection CAT6
ND-IP66-RJ-RJ
Art.-Nr. 5081807

# Building with lightning protection

with <u>not</u> correctly maintained separation distance (LPC 3 or 4)




V50-3+NPE-280
Item no.: 5093526

MCF100-3+NPE+FS
Item no.: 5096987

MCF50-NAR-TT
Item no.: 5096975

900 V, 1 tracker
PVG-BC 900K 200
Item no.: 5088430

900 V, 2 trackers
PVG-BC 900K 220
Item no.: 5088440

900 V, per tracker
V25-B+C 3-PH900
Item no.: 5097447

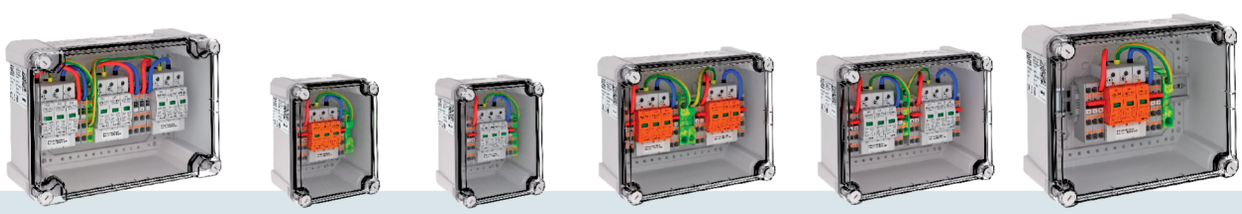
1,500 V, per tracker
PV-T1+2-1500
Item no.: 5094252

Data cable protection CAT6
ND-IP66-RJ-LSA
Item no. 5081808

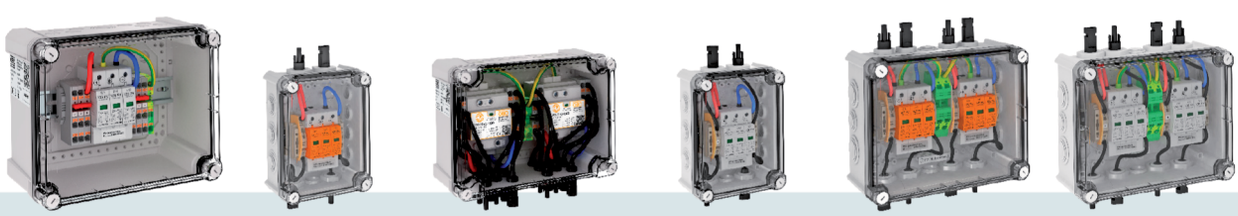
# Effectively protect PV systems from surge voltages

OBO has redesigned its portfolio of generator connection boxes for the DC protection of PV systems: the boxes pre-terminated with lightning and surge protection now safeguard the PV inverter input even more effectively and reliably.

5088400 5088405 5088410 5088415 5088420 5088460



5088425 5088430 5088435 5088440 5088445 5088450



5088455 5088564 5088462 5088554 5088565 5088556

5088635 5088640 5088651 5088654 5088660

5093596 5095383 5081807 5081808 6570105

| Anwendung | Ableiterklasse (Typ) | U Max | Anzahl MPP-Tracker | Max Anzahl Strings pro MPP Eingang \| Ausgang | Typ | Artikel-Nr. |
|---|---|---|---|---|---|---|
| **DC** | T2 | 1000 V | 1 | 1 > 1 | PVG-C1000K 100 | 5088405 |
| **DC** | T2 | 1000 V | 1 | 1 > 1 | VG-C DC-TS1000 | 5088660 |
| **DC** | T2 | 1000 V | 1 | 3 > 2 | PVG-C1000K 200 | 5088435 |
| **DC** | T2 | 1000 V | 1 | 4 > 1 | VG-C DCPH1000-4S | 5088651 |
| **DC** | T2 | 1000 V | 1 | 4 > 1 | VG-C PV1000KS4 | 5088654 |
| **DC** | T2 | 1000 V | 1 | 4 > 4 oder 5 > 3 | PVG-C1000K 400 | 5088455 |
| **DC** | T2 | 1000 V | 1 | MC4: 1 > 1 | PVG-C1000S100 | 5088554 |
| **DC** | T2 | 1000 V | 2 | 1 > 1 | PVG-C1000K 110 | 5088415 |
| **DC** | T2 | 1000 V | 2 | 3 > 2 | PVG-C1000K 220 | 5088445 |
| **DC** | T2 | 1000 V | 2 | MC4: 1 > 1 | PVG-C1000S110 | 5088556 |
| **DC** | T2 | 1000 V | 3 | 1 > 1 | PVG-C1000K 111 | 5088425 |
| **DC** | T1+2 | 900 V | 1 | 1 > 1 | PVG-BC 900K 100 | 5088400 |
| **DC** | T1+2 | 900 V | 1 | 1 > 1 | VG-BC DC TS900 | 5088635 |
| **DC** | T1+2 | 900 V | 1 | 3 > 2 | PVG-BC 900K 200 | 5088430 |
| **DC** | T1+2 | 900 V | 1 | 4 > 1 | VG-BC PV900KS4 | 5088640 |
| **DC** | T1+2 | 900 V | 1 | 4 > 4 oder 5 > 3 | PVG-BC 900K 400 | 5088450 |
| **DC** | T1+2 | 900 V | 1 | MC4: 1 > 1 | VG-BC900S1 | 5088564 |
| **DC** | T1+2 | 900 V | 2 | 1 > 1 | PVG-BC 900K 110 | 5088410 |
| **DC** | T1+2 | 900 V | 2 | 3 > 2 | PVG-BC 900K 220 | 5088440 |
| **DC** | T1+2 | 900 V | 2 | MC4: 1 > 1 | VG-BC900S11 | 5088565 |
| **DC** | T1+2 | 900 V | 3 | 1 > 1 | PVG-BC 900K 111 | 5088420 |
| **DC** | T1+2 | 900 V | 3 | 2 > 1 | PVG-BC 900K 222 | 5088460 |
| **DC** | T1+2 | 1500 V | 2 | MC4: 3 > 1 | PVG-BC 1500M 110 | 5088462 |
| **AC** | T1+2 | 230/400 V AC | TN-C, TN-S, TT | 1 > 1 | VG-V50-3+NPE-280 | 5093596 |
| **AC** | T2 | 230/400 V AC | TN-C, TN-S, TT | 1 > 1 | VG-V20-3+NPE-280 | 5095383 |
| **Daten** | D1+C1+2 | 48 V | Cat 6A | RJ45 > LSA+ | ND-IP66-RJ-LSA | 5081808 |
| **Daten** | D1+C1+2 | 48 V | Cat 6A | RJ45 > RJ45 | ND-IP66-RJ-RJ | 5081807 |
| **Hitze- und Wetterschutzdach** | | Edelstahl, schwarz pulverbeschichtet | | | WB WPR | 6570105 |

# Surge protective devices for safe arresting of partial lightning currents

Thanks to their exposed position on roofs or open fields, photovoltaic systems are particularly at risk of lightning strikes and surge voltages. To ensure continuous availability of the system, comprehensive lightning and surge protection is essential. OBO offers an entire range of surge protective devices that reliably arrest partial lightning currents – for a protected PV system.

## For DC applications


5094605


5094576


5094608


5094574


5094286
5094294


5094288
5094296


5093623


5093625


5097447


5097448


5094250


5094258

## For AC applications


5094252


5094260


5095253


5095333


5093526


5093533


5096961


5096975

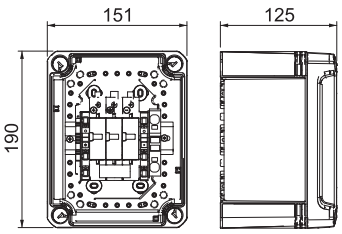

5096987

## Data technology


5081800

| Anwendung | Ableiterklasse (Typ) | U Max | Anzahl MPP-Tracker / Strings | Fernsignalisierung / Wechsler | Schutzpegel | Ableitvermögen | Typ | Artikel-Nr. |
|---|---|---|---|---|---|---|---|---|
| **DC** | T2 | 600 V | 1 | nein | < 2,6 | 40 kA (8/20) | V20-C 3PH-600 | 5094605 |
| **DC** | T2 | 600 V | 1 | ja | < 2,6 | 40 kA (8/20) | V20-C 3PHFS-600 | 5094576 |
| **DC** | T2 | 1000 V | 1 | nein | < 4,0 | 40 kA (8/20) | V20-C 3PH-1000 | 5094608 |
| **DC** | T2 | 1000 V | 1 | ja | < 4,0 | 40 kA (8/20) | V20-C 3PHFS-1000 | 5094574 |
| **DC** | T2 | 1100 V | 1 | nein | < 3,8 | 50 kA (8/20) | PV-T2-1100 | 5094286 |
| **DC** | T2 | 1100 V | 1 | ja | < 3,8 | 50 kA (8/20) | PV-T2+FS-1100 | 5094294 |
| **DC** | T2 | 1500 V | 1 | nein | < 5 | 40 kA (8/20) | PV-T2-1500 | 5094288 |
| **DC** | T2 | 1500 V | 1 | ja | < 5 | 40 kA (8/20) | PV-T2+FS-1500 | 5094296 |
| **DC** | T1+2 | 600 V | 1 | nein | < 2,6 | 12,5 kA (10/350) | V50-B+C 3PH600 | 5093623 |
| **DC** | T1+2 | 600 V | 1 | ja | < 2,6 | 12,5 kA (10/350) | V50-B+C 3PHFS600 | 5093625 |
| **DC** | T1+2 | 900 V | 1 | nein | < 3,0 | 12,5 kA (10/350) | V25-B+C 3PH900 | 5097447 |
| **DC** | T1+2 | 900 V | 1 | ja | < 3,0 | 7 kA (10/350) | V25-B+C 3PHFS900 | 5097448 |
| **DC** | T1+2 | 1100 V | 1 | nein | < 3,8 | 12,5 kA (10/350) | PV-T1+2-1100 | 5094250 |
| **DC** | T1+2 | 1100 V | 1 | ja | < 3,8 | 12,5 kA (10/350) | PV-T1+2+FS-1100 | 5094258 |
| **DC** | T1+2 | 1500 V | 1 | nein | < 5 | 10 kA (10/350) | PV-T1+2-1500 | 5094252 |
| **DC** | T1+2 | 1500 V | 1 | ja | < 5 | 10 kA (10/350) | PV-T1+2+FS-1500 | 5094260 |
| **AC** | T2 | 280 V | TNC, TN-S, TT | nein | < 1,3 | 60 kA (8/20) | V20-3+NPE-280 | 5095253 |
| **AC** | T2 | 280 V | TNC, TN-S, TT | ja | < 1,3 | 60 kA (8/20) | V20-3+NPE+FS-280 | 5095333 |
| **AC** | T1+2 | 280 V | TNC, TN-S, TT | nein | < 1,5 | 50 kA (10/350) | V50-3+NPE-280 | 5093526 |
| **AC** | T1+2 | 280 V | TNC, TN-S, TT | ja | < 1,5 | 50 kA (10/350) | V50-3+NPE+FS-280 | 5093533 |
| **AC** | T1+2 | 255 V | TNC, TN-S, TT | nein | < 1,3 | 30 kA (10/350) | MCF30-NAR-TT | 5096961 |
| **AC** | T1+2 | 255 V | TNC, TN-S, TT | ja | < 1,3 | 30 kA (10/350) | MCF30-NAR-TT+FS | 5096963 |
| **AC** | T1+2 | 255 V | TNC, TN-S, TT | nein | < 1,5 | 50 kA (10/350) | MCF50-NAR-TT | 5096975 |
| **AC** | T1+2 | 255 V | TNC, TN-S, TT | ja | < 1,5 | 50 kA (10/350) | MCF50-NAR-TT+FS | 5096977 |
| **AC** | T1+2 | 255 V | TNC, TN-S, TT | ja | < 1,5 | 100 kA (10/350) | MCF100-3+NPE+FS | 5096987 |
| **AC** | | 255 V | Spannungsabgriff für MCF-NAR | für APZ/ RfZ, 5A | | | MCF-NAR-SMG | 5096900 |
| **Daten** | C1+2 | 58 V | Cat 6A | | < 0,7 | 7 kA (8/20) | ND-CAT6A/EA | 5081800 |

## Generator connection box, type 1 + 2, for 1 string




| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-BC 900K 100** | 900 | For 1 MPPT and with push-in terminal | 1 | | **5088400** |

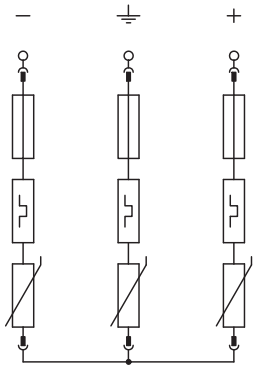
Generator connection box, type 1 + 2, for photovoltaic systems, to connect 1 string. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 3.0 kV (Uoc max = 900 V DC)
- 1 protection device with 2 push-in terminals of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

| **PVG-BC 900K 100** | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +60 °C |
| Protection rating | | IP 67 |

**Connection options**

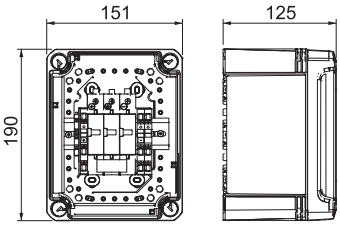


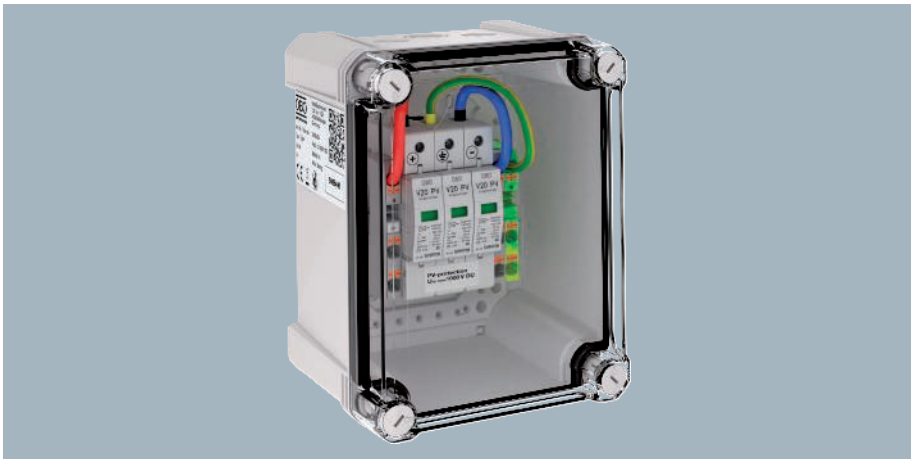



Always indicate the item number when ordering.

Type 2 | LPZ 1→2

## Generator connection box, type 2, for 1 string



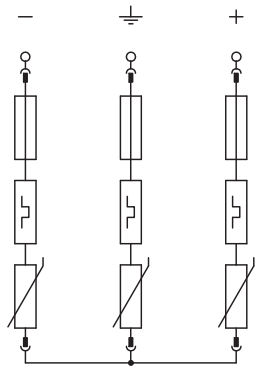
Generator connection box, type 2, for photovoltaic systems, to connect 1 string. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 4.0 kV (Uoc max = 1,000 V DC)
- 1 protection device with 2 push-in terminals of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

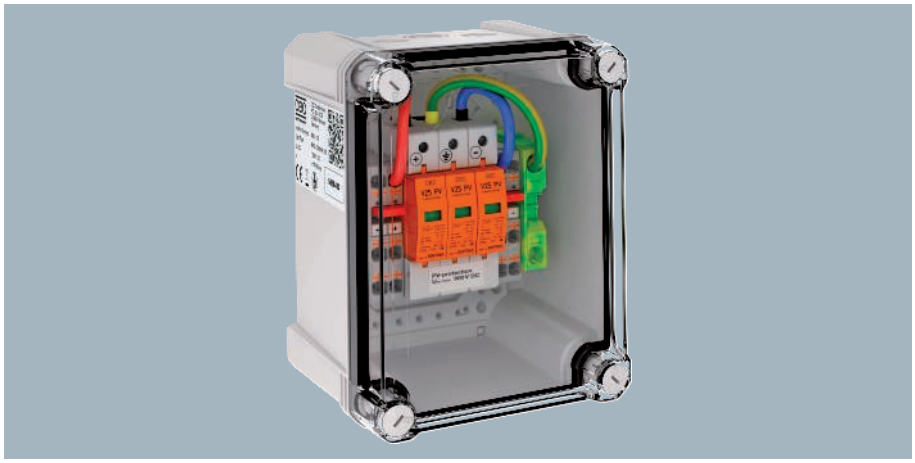
| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG- C1000K 100** | 1000 | For 1 MMPT and with push-in terminals | 1 | | **5088405** |

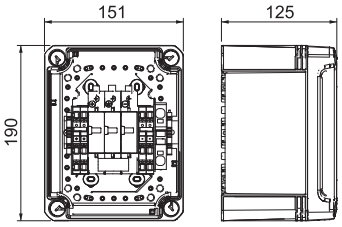
### Connection options




| PVG- C1000K 100 | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +65 °C |
| Protection rating | | IP 67 |

## Generator connection box, type 1 + 2, for 2 strings






| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-BC 900K 200** | 900 | For 1 MPPT and with push-in terminal | 1 | | **5088430** |

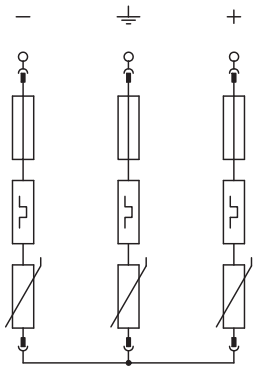
Generator connection box, type 1 + 2, for photovoltaic systems, to connect 2 strings. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 3.0 kV (Uoc max = 900 V DC)
- 1 protection device with 5 push-in terminals of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

| **PVG-BC 900K 200** | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +60 °C |
| Protection rating | | IP 67 |

**Connection options**

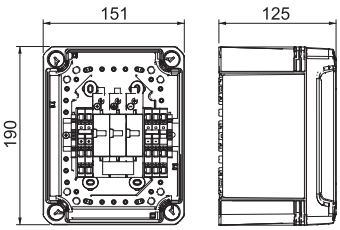


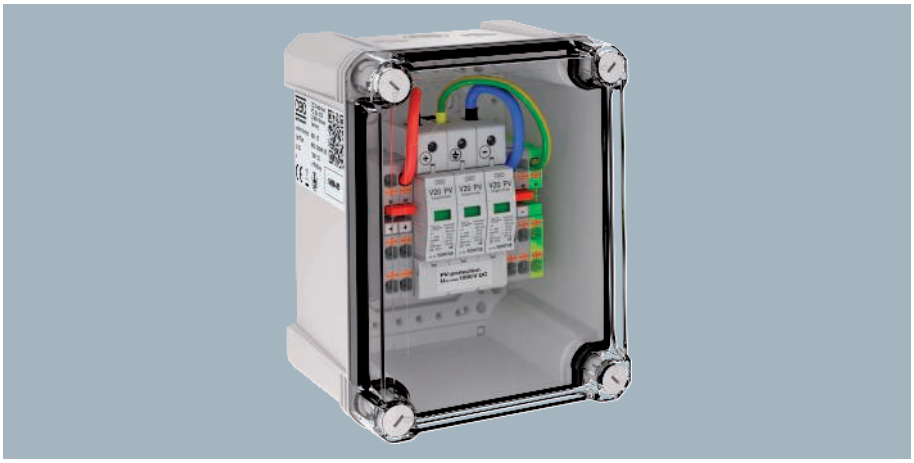



Always indicate the item number when ordering.

Type 2 LPZ 1→2

## Generator connection box, type 2, for 2 x 2 strings



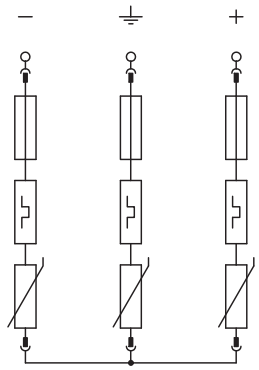
Generator connection box, type 2, for photovoltaic systems, to connect 2 x 2 strings. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 4.0 kV (Uoc max = 1,000 V DC)
- 1 protection device with 5 push-in terminals of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

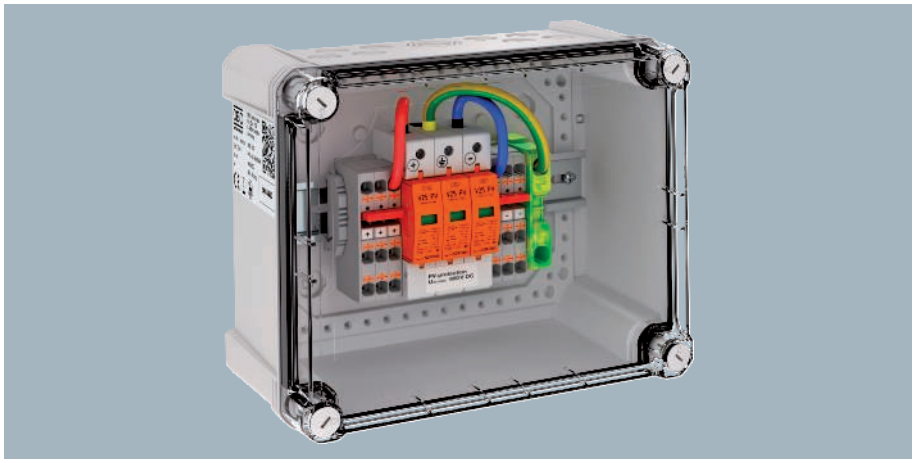
| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG- C1000K 200** | 1000 | For 1 MMPT and with push-in terminals | 1 | | **5088435** |

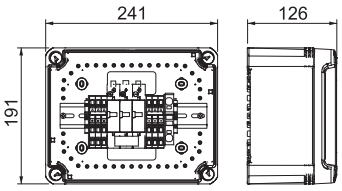
### Connection options




| PVG- C1000K 200 | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | – kA |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +65 °C |
| Protection rating | | IP 67 |

## Generator connection box, type 1 + 2, for 4 strings






| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-BC 900K 400** | 900 | For 1 MPPT and with push-in terminal | 1 | | **5088450** |

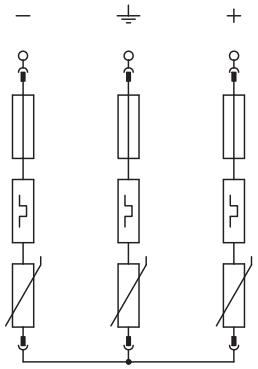
Generator connection box, type 1 + 2, for photovoltaic systems, to connect 4 strings. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 3.0 kV (Uoc max = 900 V DC)
- 1 protection device with 8 push-in terminals of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

| **PVG-BC 900K 400** | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +60 °C |
| Protection rating | | IP 67 |

**Connection options**

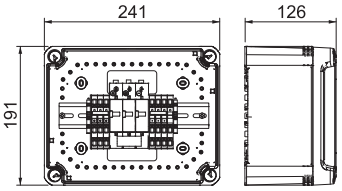


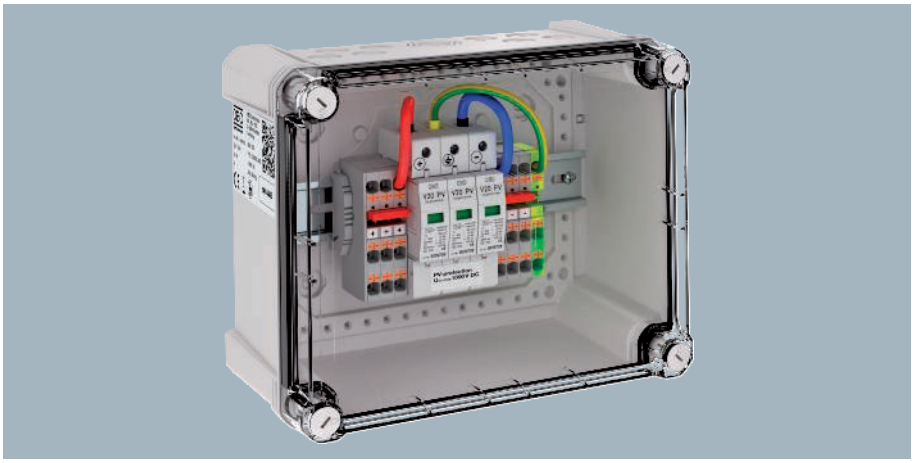



Always indicate the item number when ordering.

Type 2 | LPZ 1→2

## Generator connection box, type 2, for 4 strings



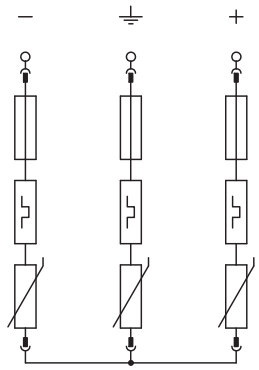
Generator connection box, type 2, for photovoltaic systems, to connect 4 strings. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 4.0 kV (Uoc max = 1,000 V DC)
- 1 protection device with 8 push-in terminals of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

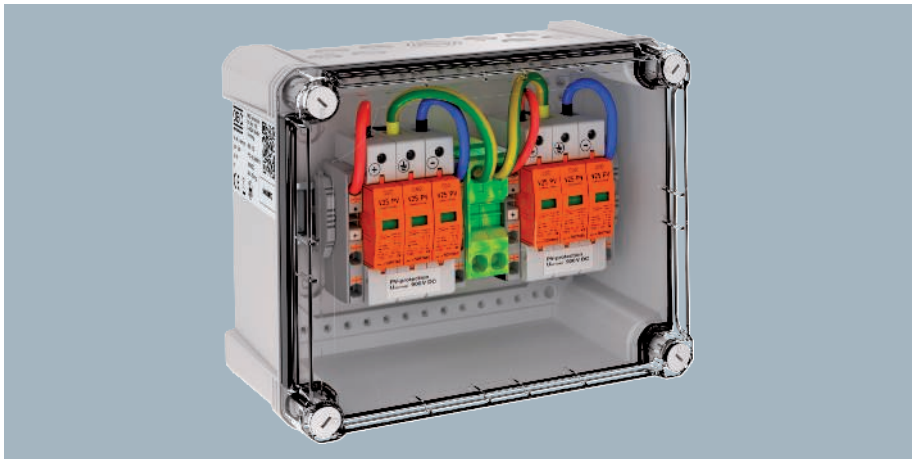
| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG- C1000K 400** | 1000 | For 1 MMPT and with push-in terminals | 1 | | **5088455** |

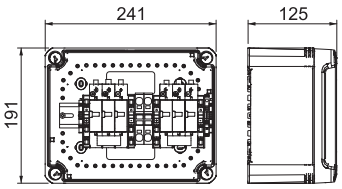
### Connection options




| PVG- C1000K 400 | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | – kA |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +65 °C |
| Protection rating | | IP 67 |

## Generator connection box, type 1 + 2, for 2 x 1 string






| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-BC 900K 110** | 900 | For 2 MPPT and with push-in terminal | 1 | | **5088410** |

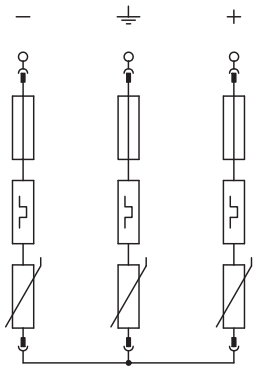
Generator connection box, type 1 + 2, for photovoltaic systems, to connect 2 x 1 string. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 3.0 kV (Uoc max = 900 V DC)
- 2 protection devices with 2 push-in terminals each of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

| **PVG-BC 900K 110** | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +60 °C |
| Protection rating | | IP 67 |

**Connection options**

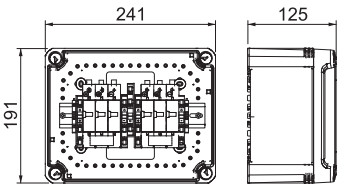


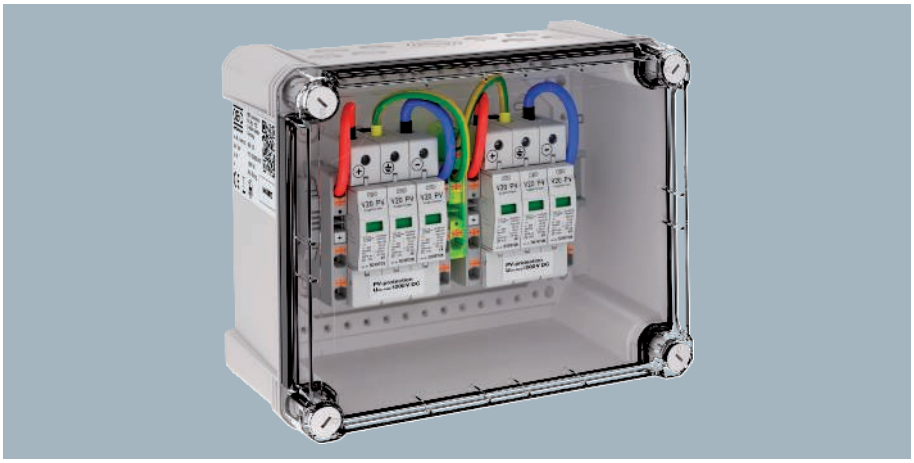



Always indicate the item number when ordering.

Type 2 LPZ 1→2

## Generator connection box, type 2, for 2 x 1 string



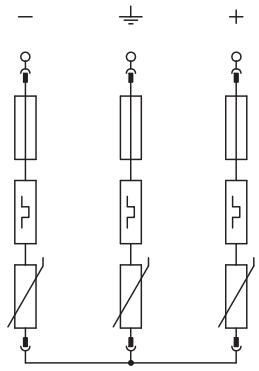
Generator connection box, type 2, for photovoltaic systems, to connect 2 x 1 string. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 4.0 kV (Uoc max = 1,000 V DC)
- 2 protection devices with 2 push-in terminals each of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

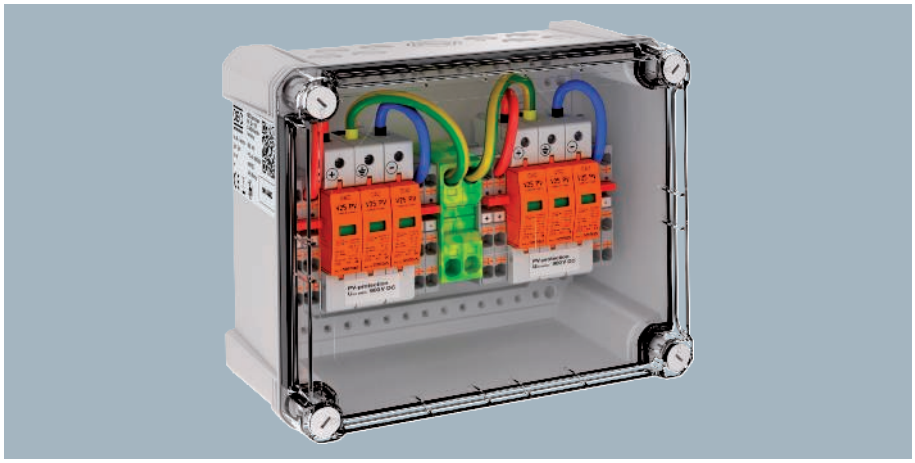
| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-C1000K 110** | 1000 | For 2 MMPT and with push-in terminals | 1 | | **5088415** |

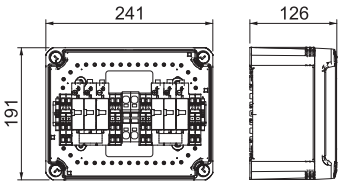
### Connection options




| PVG-C1000K 110 | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +65 °C |
| Protection rating | | IP 67 |

## Generator connection box, type 1 + 2, for 2 x 2 strings






| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-BC 900K 220** | 900 | For 2 MPPT and with push-in terminal | 1 | | **5088440** |

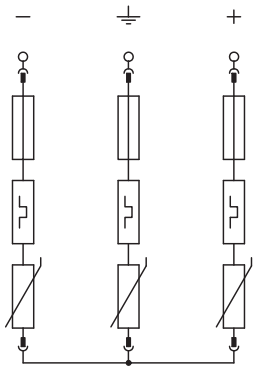
Generator connection box, type 1 + 2, for photovoltaic systems, to connect 2 x 2 strings. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 3.0 kV (Uoc max = 900 V DC)
- 2 protection devices with 5 push-in terminals each of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

| **PVG-BC 900K 220** | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +60 °C |
| Protection rating | | IP 67 |

**Connection options**

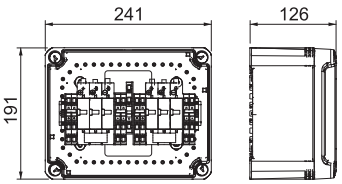


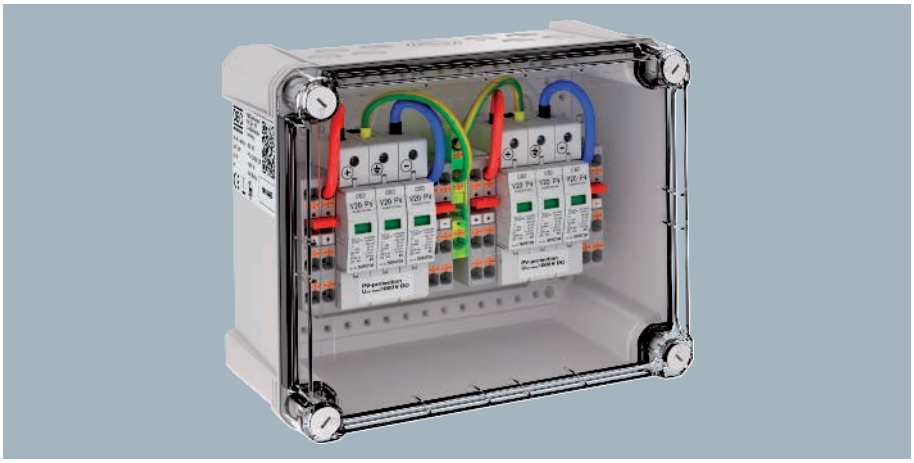



Always indicate the item number when ordering.

Type 2 | LPZ 1→2

## Generator connection box, type 2, for 2 x 2 strings



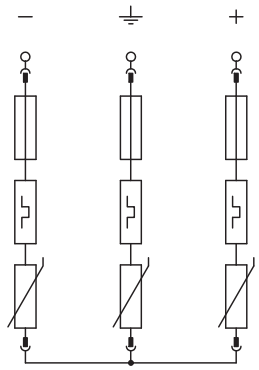
Generator connection box, type 2, for photovoltaic systems, to connect 2 x 2 strings. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 4.0 kV (Uoc max = 1,000 V DC)
- 2 protection devices with 5 push-in terminals each of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

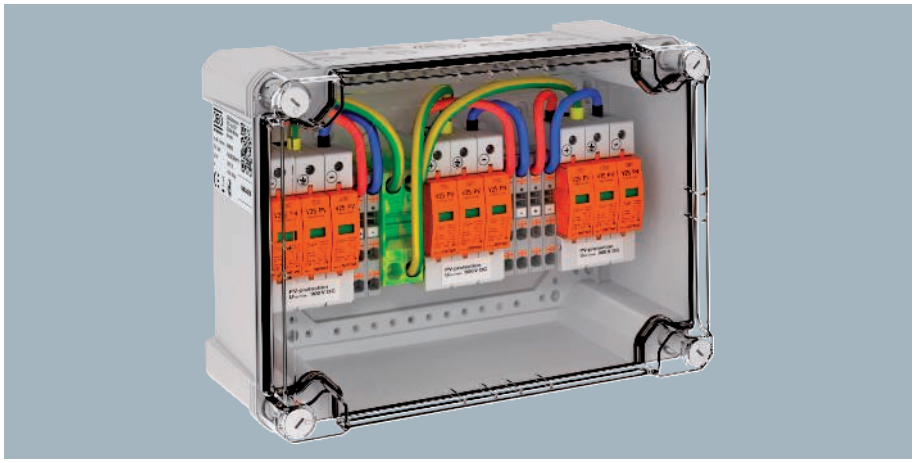
| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-C1000K 220** | 1000 | For 2 MMPT and with push-in terminals | 1 | | **5088445** |

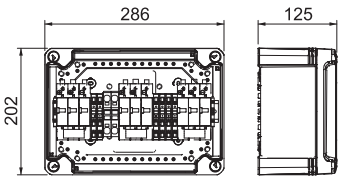
### Connection options




| PVG-C1000K 220 | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | – kA |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +65 °C |
| Protection rating | | IP 67 |

## Generator connection box, type 1 + 2, for 3 x 1 string






| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-BC 900K 111** | 900 | For 3 MPPT and with push-in terminal | 1 | | **5088420** |

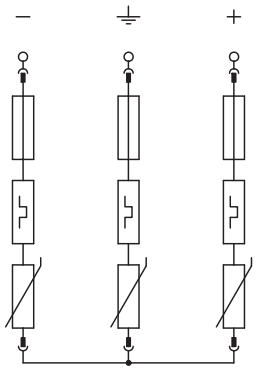
Generator connection box, type 1 + 2, for photovoltaic systems, to connect 3 x 1 string. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 3.0 kV (Uoc max = 900 V DC)
- 3 protection devices with 2 push-in terminals each of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

| **PVG-BC 900K 111** | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +60 °C |
| Protection rating | | IP 67 |

**Connection options**

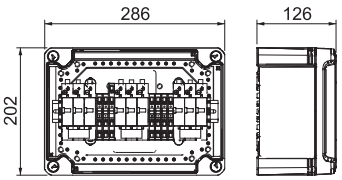


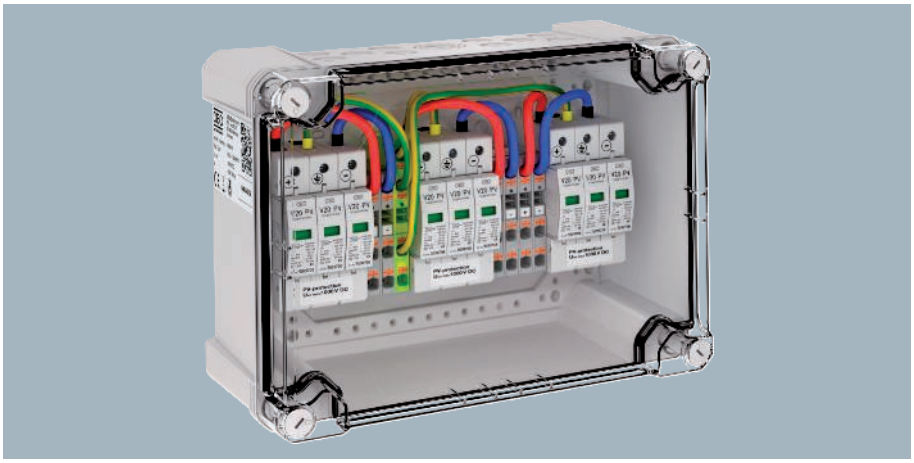



Always indicate the item number when ordering.

Type 2 | LPZ 1→2

## Generator connection box, type 2, for 3 x 1 string



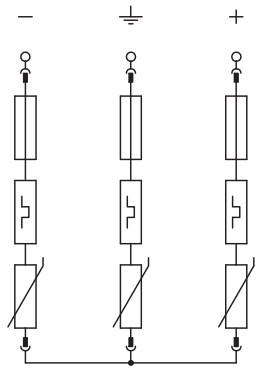
Generator connection box, type 2, for photovoltaic systems, to connect 3 x 1 string. For DC protection of the inverter.

- Varistor arrester, plug-in, with separation device in error-resistant Y circuit according to VDE 0100-712 (50539-12)
- Low DC protection level: < 4.0 kV (Uoc max = 1,000 V DC)
- 3 protection devices with 2 push-in terminal points each of up to 6 mm² pre-installed in the housing, up to 41 A DC per terminal
- Polycarbonate housing (IP67), UV-resistant for exterior use, incl. cable gland set and pressure compensation element

Additional measures may be required if there is the risk of condensation formation through wind, ice, temperature or sun!

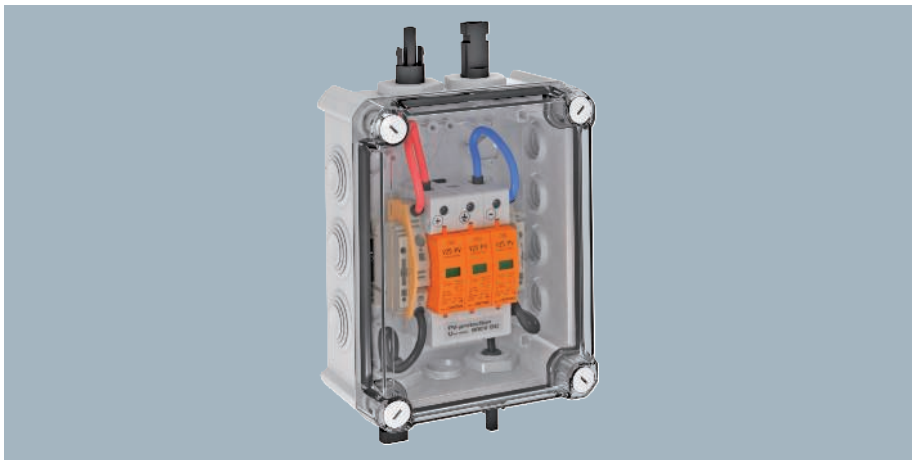
| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG- C1000K 111** | 1000 | For 3 MMPT and with push-in terminals | 1 | | **5088425** |

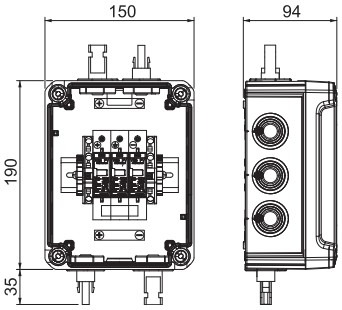
### Connection options




| PVG- C1000K 111 | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -25 - +65 °C |
| Protection rating | | IP 67 |

## Generator connection box, type 1+2, with MC4 connector for 1 x 1 string






| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **VG-BC900S1** | 900 | For one MPP and with MC4 connection | 1 | | **5088564** |

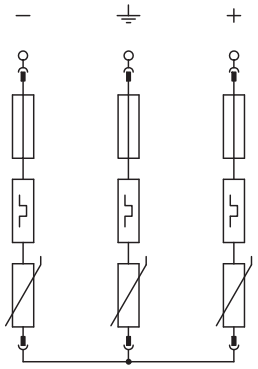
System solution, type 1+2, with MC4 connector for photovoltaic inverter with one MPP tracker

- Varistor arrester, connectable with cut-off unit in error-resistant Y circuit to VDE 0100-712 (50539-12)
- Type 1+2 combination arrester for lightning protection equipotential bonding to EN 62305 (VDE 0185-305)
- Low DC protection level: < 3.0 kV (Voc max = 900 V DC with V25-B+C/0-450PV)
- One PV string input (MC4 plug connector) at one MPP inverter input, up to 30 A DC per terminal
- Pre-mounted in polycarbonate housing (IP65), UV-resistant for use outside

For DC protection of the inverter of photovoltaic systems.
If there is a danger of condensation forming through wind, ice, temperature or sunlight, further measures may be necessary!

| **VG-BC900S1** | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -40 - +80 °C |
| Protection rating | | IP66 |

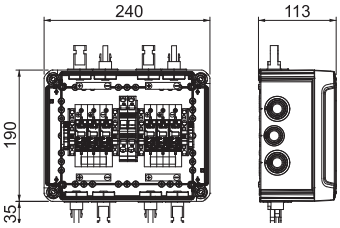
**Connection options**

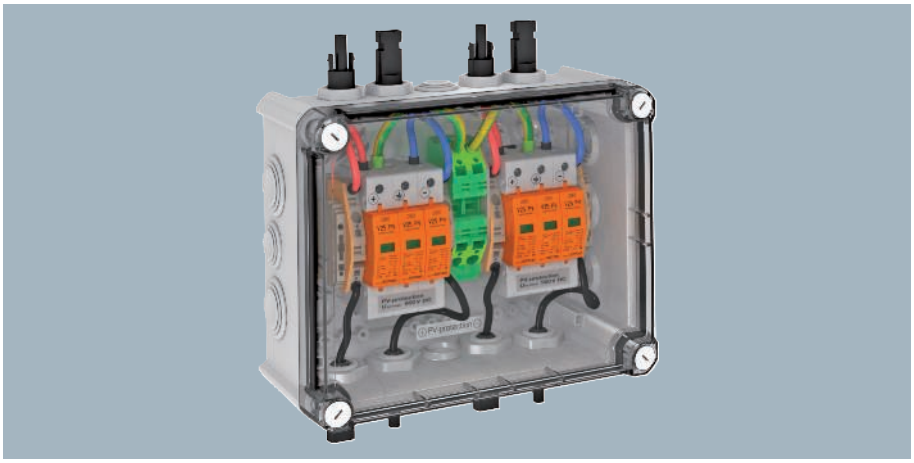





Always indicate the item number when ordering.

# Generator connection box, type 1+2, with MC4 connector for 2 x 1 string



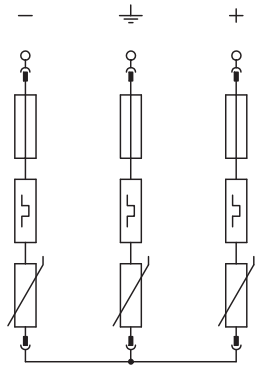
System solution, type 1+2, with MC4 connector for photovoltaic inverter with 2 separate MPP trackers

- Varistor arrester, connectable with cut-off unit in error-resistant Y circuit to VDE 0100-712 (50539-12)
- Type 1+2 combination arrester for lightning protection equipotential bonding to EN 62305 (VDE 0185-305)
- Low DC voltage protection level: < 3.0 kV (Voc max = 900V DC with V25-B+C/0-450PV)
- One PV string input (MC4 plug connector) at one MPP inverter input, up to 30A DC per terminal
- Pre-mounted in polycarbonate housing (IP66), UV-resistant for use outside

For DC protection of the inverter of photovoltaic systems.
If there is a danger of condensation forming through wind, ice, temperature or sunlight, further measures may be necessary!

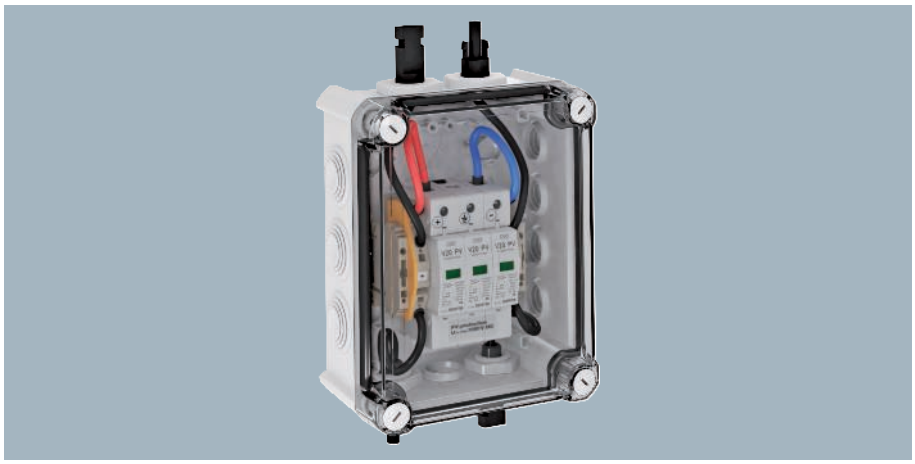
| Type | Max. continuous voltage DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **VG-BC900S11** | 900 | For two MPPs and with MC4 connection | 1 | | **5088565** |

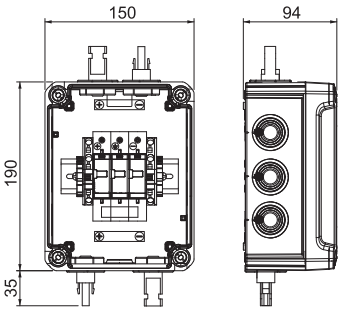
**Connection options**




| VG-BC900S11 | | |
|---|---|---|
| U max DC | $U_c$ DC | 900 V |
| SPD to EN 61643-11 | | Type 1+2 |
| Lightning protection zone LPZ | | 0→2 |
| Impulse discharge current (10/350) | $I_{imp}$ | 7 kA |
| Nominal discharge current (8/20) | $I_n$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Protection level | $U_p$ | < 3,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -40 - +80 °C |
| Protection rating | | IP66 |

## Generator connection box, type 2, with MC4 connector for 1 x 1 string






| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-C1000S100** | 1000 | For one MPP tracker and with MC4 connection | 1 | | **5088554** |

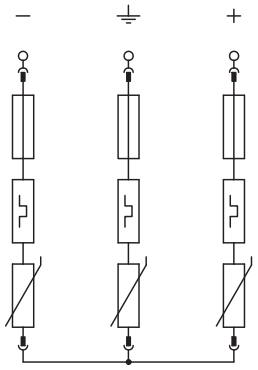
System solution, type 2, with MC4 connector for photovoltaic inverter with 1 MPP tracker

- Varistor arrester, connectable with cut-off unit in error-resistant Y circuit to VDE 0100-712 (50539-12)
- Low DC voltage protection level: < 4.0 kV (Voc max = 1,000V DC with V20-C/0-500PV)
- One PV string input (MC4 plug connector) at one MPP inverter input, up to 30A DC per terminal
- Pre-mounted in polycarbonate housing (IP66), UV-resistant for use outside

For DC protection of the inverter of photovoltaic systems.
If there is a danger of condensation forming through wind, ice, temperature or sunlight, further measures may be necessary!

| **PVG-C1000S100** | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -40 - +80 °C |
| Protection rating | | IP66 |

**Connection options**

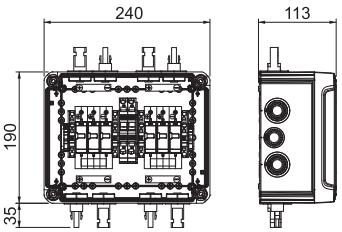


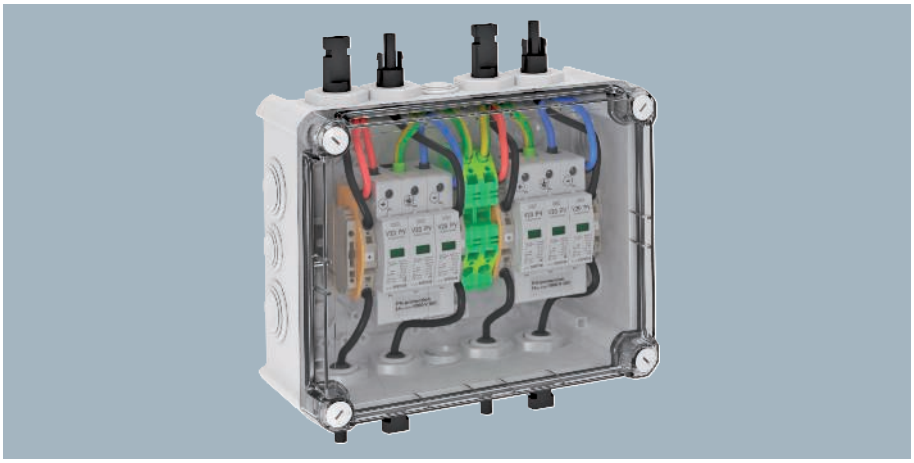



Always indicate the item number when ordering.

Type 2 | LPZ 1→2

## Generator connection box, type 2, with MC4 connector for 2 x 1 string



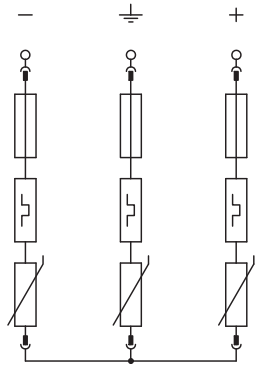
System solution, type 2, with MC4 connector for photovoltaic inverter with 2 separate MPP trackers

- Varistor arrester, connectable with cut-off unit in error-resistant Y circuit to VDE 0100-712 (50539-12)
- Low DC voltage protection level: < 4.0 kV (Voc max = 1,000V DC with V20-C/0-500PV)
- One PV string input (MC4 plug connector) at one MPP inverter input, up to 30A DC per terminal
- Pre-mounted in polycarbonate housing (IP66), UV-resistant for use outside

For DC protection of the inverter of photovoltaic systems.
If there is a danger of condensation forming through wind, ice, temperature or sunlight, further measures may be necessary!

| Type | U max DC V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **PVG-C1000S110** | 1000 | For two MPP trackers and with MC4 connection | 1 | | **5088556** |

**Connection options**




| PVG-C1000S110 | | |
|---|---|---|
| U max DC | $U_c$ DC | 1000 V |
| SPD to EN 61643-11 | | Type 2 |
| Lightning protection zone LPZ | | 1→2 |
| Nominal discharge current (8/20) | $I_n$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Protection level | $U_p$ | < 4,0 kV |
| Response time | $t_A$ | < 25 ns |
| Temperature range | ϑ | -40 - +80 °C |
| Protection rating | | IP66 |

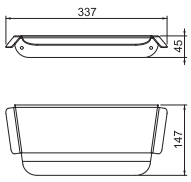
A2 | L

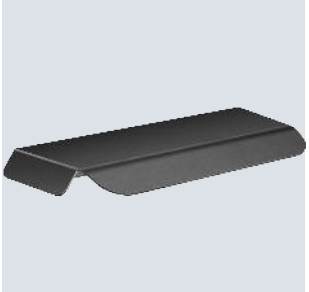
CE

## Weather protection roof for Ion charging station Basic/Key

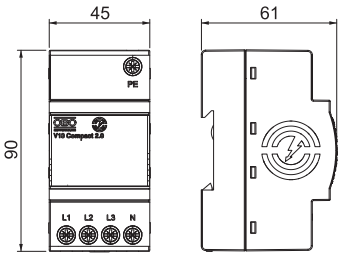
| Type | Length mm | Width mm | Height mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **WB WPR** | 147 | 337 | 45 | 1 | | **6570105** |

Weather protection roof for the Ion charging stations Basic and Key when mounted outdoors, pressure balance plug and mountig kit for brickwalls included.



## Surge arrester V10 Compact


| Type | Highest continuous voltage V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **V10 Compact2.0** | 255 | 3 + NPE | 1 | | **5093381** |

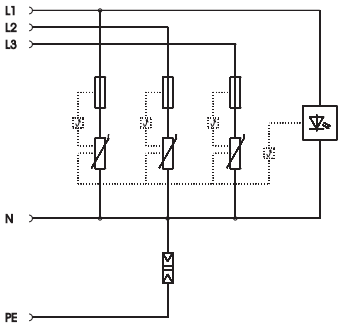
Surge protective device, compact module, type 2+3

- Surge protection in main and sub-distributions according to IEC 60364-4-44
- Arresting capacity up to 60 kA (8/20) in total
- Integrated 3+1 solution for TN and TT network systems on 45 mm module width
- High-performance varistor technology
- Including thermic and dynamic cut-off unit and visual status display

Application: Main and sub-distribution as well as device protection in three-phase current systems.

| **V10 Compact2.0** | | |
|---|---|---|
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| SPD to EN 61643-11 | | Type 2+3 |
| SPD to IEC 61643-11 | | Class II+III |
| Lightning protection zone LPZ | | 1→3 |
| Nominal discharge current (8/20 µs) [L-N] | $I_{n\ /\ L\text{-}N}$ | 10 kA |
| Nominal discharge current (8/20 µs) [N-PE] | $I_{n\ /\ N\text{-}PE}$ | 40 kA |
| Maximum discharge current (8/20 µs) [L-N] | $I_{max\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) [N-PE] | $I_{max\ /\ N\text{-}PE}$ | 60 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Protection level [L-N] | $U_p$ | 1.1 kV |
| Protection level [N-PE] | $U_{p\ /\ N\text{-}PE}$ | 1.5 kV |
| Response time | $t_A$ | < 25 ns |
| Max. mains-side overcurrent protection | | 63 A gG |
| Operating temperature range | $T_u$ | -40 - +70 °C |
| Division unit TE (17.5 mm) | | 1.5 |
| Protection rating | | IP20 |
| Conductor cross-section, flexible (fine-wire) | | 2.5 - 10 mm² |
| Conductor cross-section, flexible (fine-wire) | | 13 - 8 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 2.5 - 10 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 13 - 8 AWG |

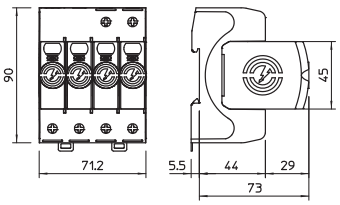
**Connection options**






Always indicate the item number when ordering.

# Surge arrester V20, 3-pole + NPE, 280 V





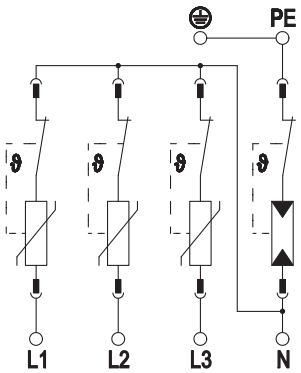
Surge arrester, type 2

- For surge voltage protection equipotential bonding to VDE 0100-443 (IEC 60364-4-44)
- Discharge capacity to 40 kA (8/20) per pole through high-performance varistors
- Modular connectable arrester with cut-off unit and visual status display
- Locking mechanism with vibration protection and voltage keying
- Plastic to UL 94 V-0
- The remote signalling variants (FS) have a potential-free changeover contact for remote signalling

Application: Equipotential bonding in main and sub-distributions.

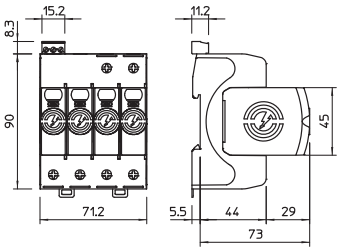
| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **V20-3+NPE-280** | 280 | 3+N/PE | IP20 | 1 | | **5095253** |

## Connection options




| V20-3+NPE-280 | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 2 |
| SPD to IEC 61643-11 | | Class II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 280 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Protection level [L-N] | $U_p$ | 1.3 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 1.5 kV |
| Residual voltage [L-N] @ 1 kA | $U_{res}$ | 0,8 kV |
| Residual voltage [L-N] @ 5 kA | $U_{res}$ | 1,0 kV |
| Max. mains-side overcurrent protection | | 160 A gL/gG |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | UL, ÖVE, VDE, KEMA |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

# Surge arrester V20, 3-pole + NPE and remote signalling, 280 V


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **V20-3+NPE+FS-280** | 280 | 3+N/PE | IP20 | 1 | | **5095333** |

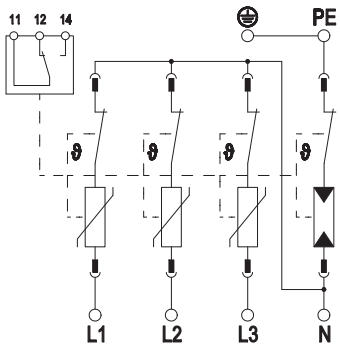
Surge arrester, type 2

- For surge voltage protection equipotential bonding to VDE 0100-443 (IEC 60364-4-44)
- Discharge capacity to 40 kA (8/20) per pole through high-performance varistors
- Modular connectable arrester with cut-off unit and visual status display
- Locking mechanism with vibration protection and voltage keying
- Plastic to UL 94 V-0
- The remote signalling variants (FS) have a potential-free changeover contact for remote signalling

Application: Equipotential bonding in main and sub-distributions.

| V20-3+NPE+FS-280 | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 2 |
| SPD to IEC 61643-11 | | Class II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 280 V |
| Nominal discharge current (8/20 µs) | $I_{n\,/\,L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Protection level [L-N] | $U_p$ | 1.3 kV |
| Combined voltage protection level [L-PE] | $U_{p\,/\,L\text{-}PE}$ | 1.5 kV |
| Residual voltage [L-N] @ 1 kA | $U_{res}$ | 0,8 kV |
| Residual voltage [L-N] @ 5 kA | $U_{res}$ | 1,0 kV |
| Max. mains-side overcurrent protection | | 160 A gL/gG |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | UL, ÖVE, VDE, KEMA |
| FM contacts | | Changeover |
| Switching power AC | | 230 V; 0,5 A |
| Switching power DC | | 230 V; 0,1 A / 75 V; 0,5 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |
| Connection cross-section, FM terminals | | 21 - 16 AWG |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

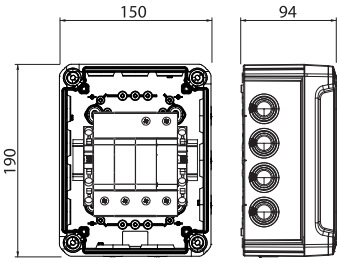
**Connection options**






Always indicate the item number when ordering.

# System solution, surge arrester V20 in housing, 3-pole + NPE, 280 V



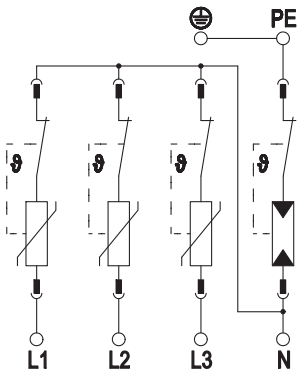

Surge arrester, type 2, according to DIN EN 61643-11

- Ideal for protecting charging stations and any vehicles connected to them
- For surge voltage protection equipotential bonding to VDE 0100-443 (IEC 60364-4-44)
- Complete unit, pre-mounted and ready for connection in polycarbonate housing (IP66)
- Arresting capacity to 40 kA (8/20) per pole through high-performance varistors

Application: AC charging device up to 22 kW, equipotential bonding in main and sub-distributors.
If there is a danger of condensation forming through wind, ice, temperature or sunlight, further measures may be necessary!

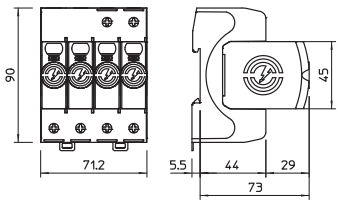
| Type | Max. continuous voltage AC V | Pole version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **VG-V20-3+NPE-280** | 280 | 3+N/PE | 1 | | **5095383** |

## Connection options




| VG-V20-3+NPE-280 | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 2 |
| SPD to IEC 61643-11 | | Class II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 280 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 40 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Protection level [L-N] | $U_p$ | 1.3 kV |
| Residual voltage [L-N] @ 1 kA | $U_{res}$ | 0,7 kV |
| Residual voltage [L-N] @ 5 kA | $U_{res}$ | 0,9 kV |
| Max. mains-side overcurrent protection | | 160 A gL/gG |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP66 |
| Approvals | | ÖVE, UL |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

## Combination arrester V50, 3-pole + NPE 280 V


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **V50-3+NPE-280** | 280 | 3+N/PE | IP20 | 1 | | **5093526** |

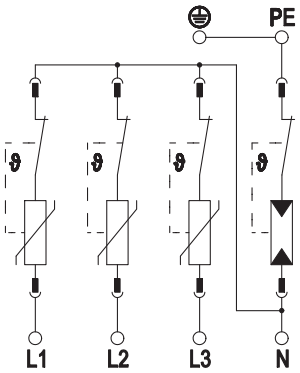
Lightning current combination arrester, type 1+2

- For lightning current equipotential bonding to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity of 12.5 kA (10/350) per pole and up to 50 kA (10/350) in total
- Modular, plug-in arrester with cut-off unit and visual status display
- Locking mechanism with vibration protection and voltage keying
- Plastic to UL 94 V-0
- The remote signalling (FS) variants have a potential-free changeover contact for remote signalling

Application: Lightning current equipotential bonding for buildings of class III and IV.

| **V50-3+NPE-280** | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 280 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 12.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 50 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 80 kA |
| Protection level [L-N] | $U_p$ | 1.3 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 2.5 kV |
| Residual voltage [L-N] @ 1 kA | $U_{res}$ | 0,7 kV |
| Residual voltage [L-N] @ 5 kA | $U_{res}$ | 0,8 kV |
| Max. mains-side overcurrent protection | | 160 A gL/gG |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | UL, KEMA, ÖVE, VDE |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

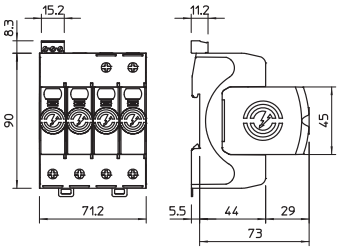
**Connection options**






Always indicate the item number when ordering.

# Combination arrester V50, 3-pole + NPE with FS 280 V





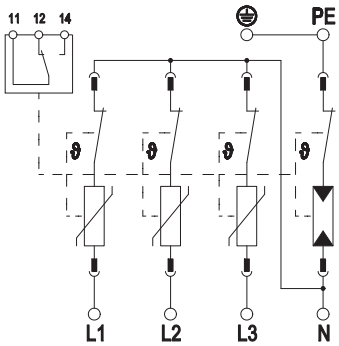
Lightning current combination arrester, type 1+2

- For lightning current equipotential bonding to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity of 12.5 kA (10/350) per pole and up to 50 kA (10/350) in total
- Modular, plug-in arrester with cut-off unit and visual status display
- Locking mechanism with vibration protection and voltage keying
- Plastic to UL 94 V-0
- The remote signalling (FS) variants have a potential-free changeover contact for remote signalling

Application: Lightning current equipotential bonding for buildings of class III and IV.

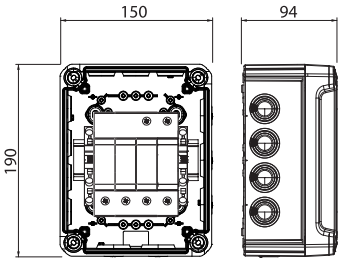
| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **V50-3+NPE+FS-280** | 280 | 3+N/PE | IP20 | 1 | | **5093533** |

## Connection options




| V50-3+NPE+FS-280 | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 280 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 12.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 50 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 80 kA |
| Protection level [L-N] | $U_p$ | 1.3 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 2.5 kV |
| Residual voltage [L-N] @ 1 kA | $U_{res}$ | 0,7 kV |
| Residual voltage [L-N] @ 5 kA | $U_{res}$ | 0,8 kV |
| Max. mains-side overcurrent protection | | 160 A gL/gG |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | UL, KEMA, ÖVE, VDE |
| FM contacts | | Changeover |
| Switching power AC | | 230 V; 0,5 A |
| Switching power DC | | 230 V; 0,1 A / 75 V; 0,5 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |
| Connection cross-section, FM terminals | | 21 - 16 AWG |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

## Combination arrester V50, 3-pole + NPE 280 V




| Type | Max. continuous voltage AC V | Pole version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **VG-V50-3+NPE-280** | 280 | 3+N/PE | 1 | | **5093596** |

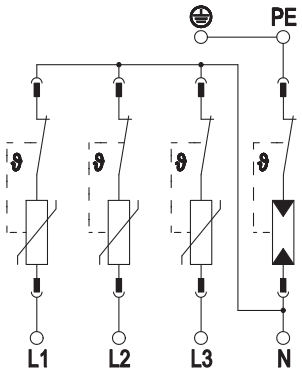
Lightning current combination arrester, type 1+2 to DIN EN 61643-11

- Ideal for protecting charging stations and any vehicles connected to them
- For lightning protection equipotential bonding to VDE 0185-305 (IEC 62305)
- Complete unit, pre-mounted and ready for connection in polycarbonate housing (IP66)
- Lightning current arresting capacity 12.5 kA (10/350) per pole and up to 50 kA (10/350) in total

Application: AC charging device up to 22 kW, lightning protection equipotential bonding for buildings of Class III and IV.
If there is a danger of condensation forming through wind, ice, temperature or sunlight, further measures may be necessary!

| VG-V50-3+NPE-280 | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 280 V |
| Nominal discharge current (8/20 µs) | $I_{n\,/\,L\text{-}N}$ | 30 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 12.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 50 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 50 kA |
| Protection level [L-N] | $U_p$ | 1.3 kV |
| Residual voltage [L-N] @ 1 kA | $U_{res}$ | 0,7 kV |
| Residual voltage [L-N] @ 5 kA | $U_{res}$ | 0,8 kV |
| Max. mains-side overcurrent protection | | 160 A gL/gG |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP66 |
| Approvals | | UL, ÖVE, VDE |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

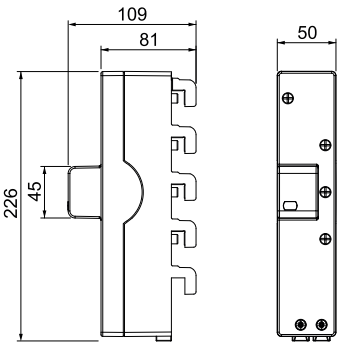
**Connection options**






Always indicate the item number when ordering.

# LightningController - MCF25-NAR-TNC





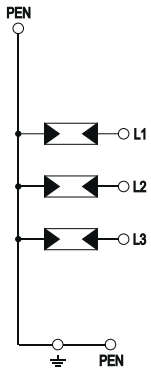
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-C systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 25 kA (10/350) 3-pole
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100

Application: Building with outside cable infeed.

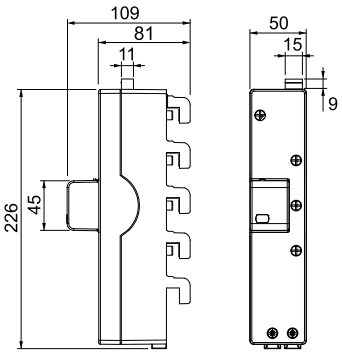
| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF25-NAR-TNC** | 255 | 3 | IP20 | 1 | | **5096950** |

## Connection options




| MCF25-NAR-TNC | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 8.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 25 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Combined voltage protection level [L-PEN] | $U_{p\ /\ L\text{-}PEN}$ | 1.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |

## LightningController - MCF25-NAR-TNC+FS


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF25-NAR-TNC+FS** | 255 | 3 | IP20 | 1 | | **5096953** |

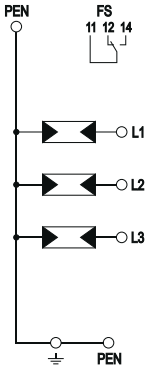
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-C systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 25 kA (10/350) 3-pole
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100
- With potential-free changeover contact for remote signalling

Application: Building with outside cable infeed.

| **MCF25-NAR-TNC+FS** | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 8.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 25 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Combined voltage protection level [L-PEN] | $U_{p\ /\ L\text{-}PEN}$ | 1.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |
| FM contacts | | Changeover |
| Switching power AC | | 250 V/ 2 A |
| Switching power DC | | 250 V/ 0,1 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |

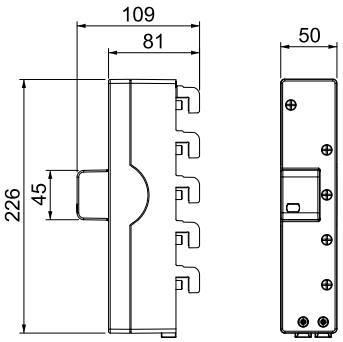
**Connection options**






Always indicate the item number when ordering.

# LightningController - MCF30-NAR-TT





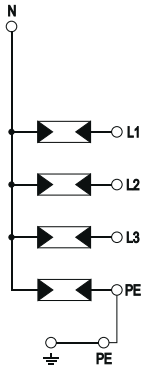
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-S and TT systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 30 kA (10/350) 3+NPE
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100

Application: Building with outside cable infeed.

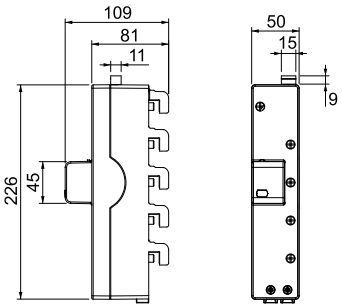
| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF30-NAR-TT** | 255 | 3+N/PE | IP20 | 1 | | **5096961** |

## Connection options




| MCF30-NAR-TT | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 30 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 80 kA |
| Protection level [L-N] | $U_p$ | 1.5 kV |
| Protection level [N-PE] | $U_{p\ /\ N\text{-}PE}$ | 1.5 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 2.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| TOV voltage [N-PE] – withstand mode – 200 ms | $U_{t\ /\ N\text{-}PE,\ 200\ ms}$ | 1200 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |

## LightningController - MCF30-NAR-TT+FS


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF30-NAR-TT+FS** | 255 | 3+N/PE | IP20 | 1 | | **5096963** |

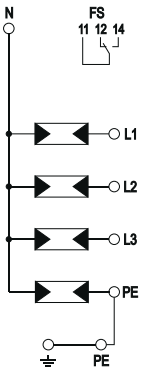
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-S and TT systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 30 kA (10/350) 3+NPE
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100
- With potential-free changeover contact for remote signalling

Application: Building with outside cable infeed.

| **MCF30-NAR-TT+FS** | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 7.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 30 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 80 kA |
| Protection level [L-N] | $U_p$ | 1.5 kV |
| Protection level [N-PE] | $U_{p\ /\ N\text{-}PE}$ | 1.5 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 2.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| TOV voltage [N-PE] – withstand mode – 200 ms | $U_{t\ /\ N\text{-}PE,\ 200\ ms}$ | 1200 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |
| FM contacts | | Changeover |
| Switching power AC | | 250 V/ 2 A |
| Switching power DC | | 250 V/ 0,1 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |

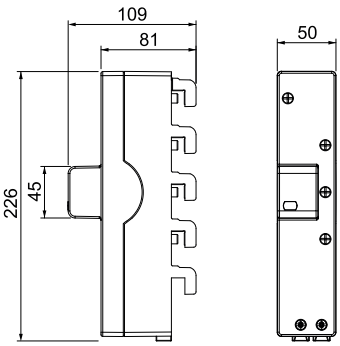
**Connection options**






Always indicate the item number when ordering.

# LightningController - MCF38-NAR-TNC





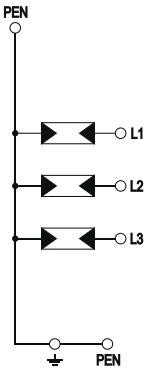
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-C systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 38 kA (10/350) 3-pole
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100

Application: Building with lightning protection or outside cable infeed.

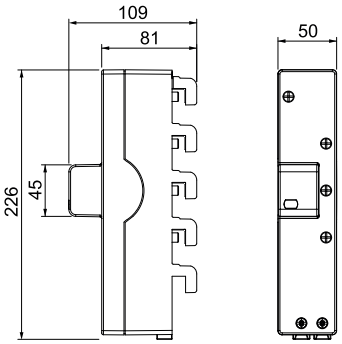
| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF38-NAR-TNC** | 255 | 3 | IP20 | 1 | | **5096971** |

## Connection options




| MCF38-NAR-TNC | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 12.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 38 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Combined voltage protection level [L-PEN] | $U_{p\ /\ L\text{-}PEN}$ | 1.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |

## LightningController - MCF38-NAR-TNC+FS


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF38-NAR-TNC+FS** | 255 | 3 | IP20 | 1 | | **5096973** |

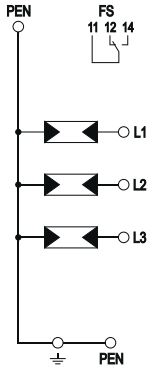
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-C systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 38 kA (10/350) 3-pole
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100
- With potential-free changeover contact for remote signalling

Application: Buildings with lightning protection or outside cable infeed.

| **MCF38-NAR-TNC+FS** | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 12.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 38 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 60 kA |
| Combined voltage protection level [L-PEN] | $U_{p\ /\ L\text{-}PEN}$ | 1.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |
| FM contacts | | Changeover |
| Switching power AC | | 250 V/ 2 A |
| Switching power DC | | 250 V/ 0,1 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |

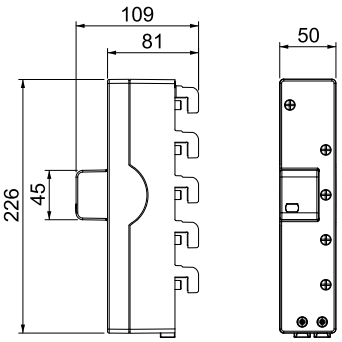
**Connection options**






Always indicate the item number when ordering.

# LightningController - MCF50-NAR-TT





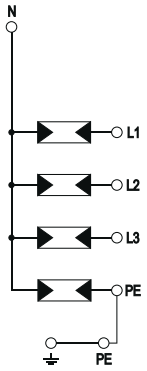
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-S and TT systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 50 kA (10/350) 3+NPE
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100

Application: Building with lightning protection or outside cable infeed.

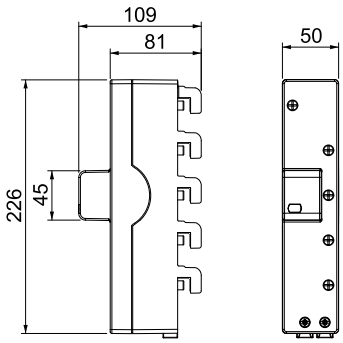
| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF50-NAR-TT** | 255 | 3+N/PE | IP20 | 1 | | **5096975** |

## Connection options




| MCF50-NAR-TT | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 12.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 50 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 80 kA |
| Protection level [L-N] | $U_p$ | 1.5 kV |
| Protection level [N-PE] | $U_{p\ /\ N\text{-}PE}$ | 1.5 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 2.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| TOV voltage [N-PE] – withstand mode – 200 ms | $U_{t\ /\ N\text{-}PE,\ 200\ ms}$ | 1200 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |

## LightningController - MCF50-NAR-TT+FS


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF50-NAR-TT+FS** | 255 | 3+N/PE | IP20 | 1 | | **5096977** |

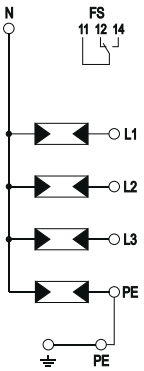
Combination arrester, type 1+2, for mounting on 40 mm busbars, for TN-S and TT systems

- Protection level ≤1.5 kV to protect the terminals
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 50 kA (10/350) 3+NPE
- Fulfils the requirements of VDE 0100-534 (IEC 60364-5-53)
- Line follow current quenching up to 50 kA and max. backup fuse up to 160 A gL/gG
- Spark gaps for use in the pre-meter area according to VDE-AR-N 4100
- With potential-free changeover contact for remote signalling

Application: Building with lightning protection or outside cable infeed.

| **MCF50-NAR-TT+FS** | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 20 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 12.5 kA |
| Total discharge current (10/350) | $I_{total}$ | 50 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 80 kA |
| Protection level [L-N] | $U_p$ | 1.5 kV |
| Protection level [N-PE] | $U_{p\ /\ N\text{-}PE}$ | 1.5 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 2.5 kV |
| TOV voltage [L-N] – fail safe mode – 120 min. | $U_{T\ /\ L\text{-}N,\ 120\ min}$ | 442 V |
| TOV voltage [N-PE] – withstand mode – 200 ms | $U_{t\ /\ N\text{-}PE,\ 200\ ms}$ | 1200 V |
| Max. mains-side overcurrent protection | | 160 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE |
| Conductor cross-section, flexible (fine-wire) | | 10 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 35 mm² |
| FM contacts | | Changeover |
| Switching power AC | | 250 V/ 2 A |
| Switching power DC | | 250 V/ 0,1 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |

**Connection options**

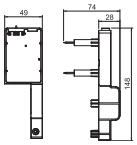





Always indicate the item number when ordering.

## Voltage tap for MCF-NAR series

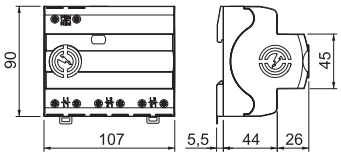
| Type | Nominal voltage AC (50/60 Hz) V | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **MCF-NAR-SMG** | 230 | IP20 | 1 | | **5096900** |




Adapter for voltage tap in power-side connection compartment

- Simple and space-saving voltage taps for the termination point meter position (APZ) and the space for additional applications (RfZ)
- With spring contacts for easy connection of wires
- Includes 2 plug sockets
- Safety screw to prevent unwanted loosening
- Replaceable 5 A fine-wire fuse with a breaking capacity of 50 kA
- Fuse holder 6.3 x 32 mm

## LightningController Compact - MCF75


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF75-3+FS** | 255 | 3 | IP20 | 1 | | **5096981** |

Combination arrester, lightning current and surge arrester, type 1+2

- Protection level ≤ 1.5 kV
- For lightning protection equipotential bonding to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity to 75 kA (10/350), 3-pole
- Line following current quenching 50 kA Ipeak, arrester backup fuse to 315 A gL/gG
- Fulfils the requirements of VDE-AR-N 4100 for use in pre-meter area
- Encapsulated, non-extinguishing spark gap arrester for use in distributor housings

Application: Industrial systems and buildings with external lightning protection of the highest class I to IV.

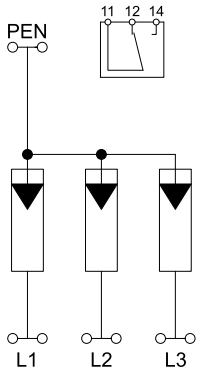
Combination arrester, lightning current and surge arrester, type 1+2

- Protection level ≤ 1.5 kV
- For lightning protection equipotential bonding to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity to 75 kA (10/350), 3-pole
- Line following current quenching 50 kA Ipeak, arrester backup fuse to 315 A gL/gG
- Fulfils the requirements of VDE-AR-N 4100 for use in pre-meter area
- Encapsulated, non-extinguishing spark gap arrester for use in distributor housings

Application: Industrial systems and buildings with external lightning protection of the highest class I to IV.

| MCF75-3+FS | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\ /\ L\text{-}N}$ | 35 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 25 kA |
| Total discharge current (10/350) | $I_{total}$ | 75 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 75 kA |
| Combined voltage protection level [L-PEN] | $U_{p\ /\ L\text{-}PEN}$ | 1.5 kV |
| Max. mains-side overcurrent protection | | 315 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE, UL |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 25 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 3 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

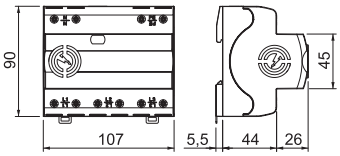
**Connection options**






Always indicate the item number when ordering.

# LightningController Compact - MCF100





Combination arrester, lightning current and surge arrester, type 1+2

- Protection level ≤ 1.5 kV
- For lightning protection equipotential bonding to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 100 kA (10/350), 3+NPE
- Line following current quenching 50 kA Ipeak, arrester backup fuse to 315 A gL/gG
- Fulfils the requirements of VDE-AR-N 4100 for use in pre-meter area
- Encapsulated, non-extinguishing spark gap arrester for use in distributor housings

Application: Industrial systems and buildings with external lightning protection of the highest class I to IV.

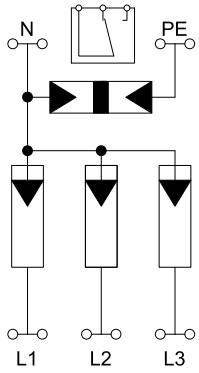
Combination arrester, lightning current and surge arrester, type 1+2

- Protection level ≤ 1.5 kV
- For lightning protection equipotential bonding to VDE 0185-305 (IEC 62305)
- Lightning current arresting capacity up to 100 kA (10/350), 3+NPE
- Line following current quenching 50 kA Ipeak, arrester backup fuse to 315 A gL/gG
- Fulfils the requirements of VDE-AR-N 4100 for use in pre-meter area
- Encapsulated, non-extinguishing spark gap arrester for use in distributor housings

Application: Industrial systems and buildings with external lightning protection of the highest class I to IV.

| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF100-3+NPE+FS** | 255 | 3+N/PE | IP20 | 1 | | **5096987** |

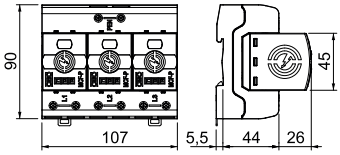
## Connection options




| MCF100-3+NPE+FS | | |
|---|---|---|
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| SPD to UL 1449 | | Type 4 |
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage AC | $U_C$ | 255 V |
| Nominal discharge current (8/20 µs) | $I_{n\,/\,L\text{-}N}$ | 35 kA |
| Maximum discharge current (8/20 µs) | $I_{max}$ | 50 kA |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 25 kA |
| Total discharge current (10/350) | $I_{total}$ | 100 kA |
| Maximum discharge current (8/20 µs) [total] | $I_{total}$ | 100 kA |
| Protection level [L-N] | $U_p$ | 1.5 kV |
| Max. mains-side overcurrent protection | | 315 A |
| Short-circuit withstand for max. mains-side overcurrent protection | | 50 kA eff |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Protection rating | | IP20 |
| Approvals | | VDE, UL |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 25 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 3 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

Type 1 | LPZ 0→2 | 230/400 V System

## Lightning current arrester MCF-P, 3-pole


| Type | Maximum continuous voltage (L-N) V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF-P-3** | 255 | 3 | IP20 | 1 | | **5096945** |

Lightning current arrester type 1+2+3

- Lightning current arresting capacity to 35 kA (10/350) per pole
- Voltage protection level < 1.5 kV
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Follow current quenching rating Ifi 50 kA
- Fulfils the requirements of VDE-AR-N 4100 for use in the pre-meter area

Application: Industrial systems and buildings with external lightning protection of the classes I to IV.

| **MCF-P-3** | | |
|---|---|---|
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage (L-N) | $U_C$ | 255 V |
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 35 kA |
| Total discharge current (10/350) | $I_{total}$ | 105 kA |
| Nominal discharge current (8/20 µs) [L-N] | $I_{n\,/\,L\text{-}N}$ | 35 kA |
| Maximum discharge current (8/20 µs) [L-N] | $I_{max\,/\,L\text{-}N}$ | 50 kA |
| Protection level [L-N] | $U_p$ | 1.5 kV |
| Combined voltage protection level [L-PEN] | $U_{p\,/\,L\text{-}PEN}$ | 1.5 kV |
| Response time [L-N] | $t_{A\,/\,L\text{-}N}$ | <100 ns |
| Max. mains-side overcurrent protection | | 315 A gL/gG |
| Operating temperature range | $T_u$ | -40 - +70 °C |
| Size | | 6 part units |
| Protection rating | | IP20 |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

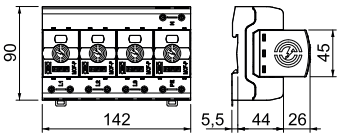
**Connection options**



Always indicate the item number when ordering.

Type 1 | LPZ 0→2 | 220/400 V System

# Lightning current arrester MCF-P, 3+NPE





Lightning current arrester type 1+2+3

- Lightning current discharge capacity to 35 kA (10/350) per pole
- Lightning current discharge capacity to 100 kA (10/350) total
- Voltage protection level < 1.5 kV
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Follow current quenching rating Ifi 50 kA
- Fulfils the requirements of VDE-AR-N 4100 for use in the pre-meter area

Application: Industrial systems and buildings with external lightning protection of the classes I to IV.

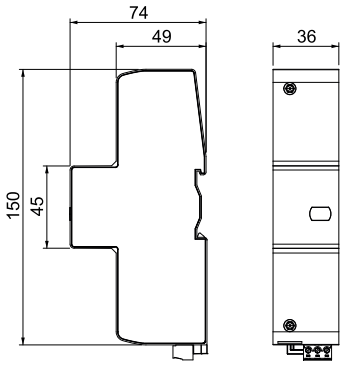
| Type | Maximum continuous voltage (L-N) V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF-P-3+NPE** | 255 | 3+N/PE | IP20 | 1 | | **5096947** |

**Connection options**

| MCF-P-3+NPE | | |
|---|---|---|
| Nominal voltage AC (50/60 Hz) | $U_n$ | 230 V |
| Maximum continuous voltage (L-N) | $U_C$ | 255 V |
| Maximum continuous voltage (N-PE) | $U_C$ | 255 V |
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 35 kA |
| Impulse discharge current (10/350 µs) [N/PE] | $I_{imp\ /\ N\text{-}PE}$ | 100 kA |
| Total discharge current (10/350) | $I_{total}$ | 100 kA |
| Nominal discharge current (8/20 µs) [L-N] | $I_{n\ /\ L\text{-}N}$ | 35 kA |
| Nominal discharge current (8/20 µs) [L-PE] | $I_{n\ /\ L\text{-}PE}$ | 35 kA |
| Nominal discharge current (8/20 µs) [N-PE] | $I_{n\ /\ N\text{-}PE}$ | 100 kA |
| Maximum discharge current (8/20 µs) [L-N] | $I_{max\ /\ L\text{-}N}$ | 50 kA |
| Maximum discharge current (8/20 µs) [N-PE] | $I_{max\ /\ N\text{-}PE}$ | 100 kA |
| Protection level [L-N] | $U_p$ | 1.5 kV |
| Protection level [N-PE] | $U_{p\ /\ N\text{-}PE}$ | 1.5 kV |
| Combined voltage protection level [L-PE] | $U_{p\ /\ L\text{-}PE}$ | 2.5 kV |
| Response time [L-N] | $t_{A\ /\ L\text{-}N}$ | <100 ns |
| Response time [N-PE] | $t_{A\ /\ N\text{-}PE}$ | <100 ns |
| Max. mains-side overcurrent protection | | 315 A gL/gG |
| Operating temperature range | $T_u$ | -40 - +70 °C |
| Size | | 8 part units |
| Protection rating | | IP20 |
| Conductor cross-section, flexible (fine-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 1.5 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 16 - 2 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 16 - 2 AWG |

## Lightning current arrester MCF-C

Type 1 | LPZ 0→2 | 230/400 V System


| Type | Max. continuous voltage AC V | Pole version | Protection rating | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **MCF-C+FS-440** | 440 | 1 | IP20 | 1 | | **5096917** |

Lightning current arrester type 1+2

- Voltage protection level < 2.5 kV
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current discharge capacity to 25 kA (10/350)
- Follow current quenching rating Ifi 50 kA
- Max. pre-fuse 315 A gL/gG
- Fulfils the requirements of VDE-AR-N 4100 for use in the pre-meter area
- The FS variant possesses a potential-free changeover contact for remote signalling

Application: For 400/690 V network systems and for lightning protection classes I to IV without exception.

| **MCF-C+FS-440** | | |
|---|---|---|
| Nominal voltage AC (50/60 Hz) | $U_n$ | 400 V |
| Maximum continuous voltage (L-N) | $U_C$ | 440 V |
| Maximum continuous voltage (N-PE) | $U_C$ | – V |
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 25 kA |
| Nominal discharge current (8/20 µs) [L-N] | $I_{n\,/\,L\text{-}N}$ | 35 kA |
| Maximum discharge current (8/20 µs) [L-N] | $I_{max\,/\,L\text{-}N}$ | – kA |
| Protection level [L-N] | $U_p$ | 2.5 kV |
| Response time [L-N] | $t_{A\,/\,L\text{-}N}$ | <100 ns |
| Max. mains-side overcurrent protection | | 315 A gL/gG |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Size | | 2 part units |
| Protection rating | | IP20 |
| Conductor cross-section, flexible (fine-wire) | | 6 - 25 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 6 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 10 - 3 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 2 AWG |
| FM contacts | | Changeover |
| Switching power AC | | 230 V; 0,5 A |
| Switching power DC | | 230 V; 0,1 A / 75 V; 0,5 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |
| Connection cross-section, FM terminals | | 21 - 16 AWG |

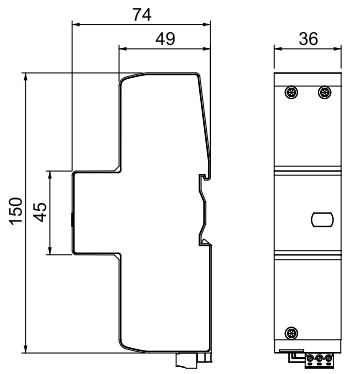
**Connection options**



Always indicate the item number when ordering.

Type 1 | LPZ 0→2 | 220/400 V System

# Lightning current arrester MC-C-NPE





Lightning current arrester type 1+2

- Voltage protection level < 2.5 kV
- Lightning protection equipotential bonding according to VDE 0185-305 (IEC 62305)
- Lightning current discharge capacity to 100 kA (10/350)
- Follow current interrupt rating Ifi 100 A
- Fulfils the requirements of VDE-AR-N 4100 for use in the pre-meter area
- The FS variant possesses a potential-free changeover contact for remote signalling

Application: For 400/690 V network systems and for lightning protection classes I to IV without exception.

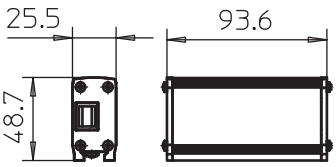
| Type | Highest continuous voltage V | Version | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **MC-C-NPE+FS-440** | – | – | 1 | | **5096922** |

## Connection options

| **MC-C-NPE+FS-440** | | |
|---|---|---|
| Nominal voltage AC (50/60 Hz) | $U_n$ | 400 V |
| Maximum continuous voltage (L-N) | $U_C$ | – V |
| Maximum continuous voltage (N-PE) | $U_C$ | 440 V |
| SPD to EN 61643-11 | | Type 1+2 |
| SPD to IEC 61643-11 | | Class I+II |
| Impulse discharge current (10/350 µs) | $I_{imp}$ | 100 kA |
| Nominal discharge current (8/20 µs) [L-N] | $I_{n\ /\ L\text{-}N}$ | 100 kA |
| Maximum discharge current (8/20 µs) [L-N] | $I_{max\ /\ L\text{-}N}$ | – kA |
| Protection level [L-N] | $U_p$ | – kV |
| Response time [L-N] | $t_{A\ /\ L\text{-}N}$ | – ns |
| Max. mains-side overcurrent protection | | – |
| Operating temperature range | $T_u$ | -40 - +80 °C |
| Size | | 2 part units |
| Protection rating | | IP20 |
| Conductor cross-section, flexible (fine-wire) | | 6 - 25 mm² |
| Conductor cross-section, rigid (single wire/multi-wire) | | 6 - 35 mm² |
| Conductor cross-section, flexible (fine-wire) | | 10 - 3 AWG |
| Conductor cross-section, rigid (single wire/multi-wire) | | 10 - 2 AWG |
| FM contacts | | Changeover |
| Switching power AC | | 230 V; 0,5 A |
| Switching power DC | | 230 V; 0,1 A / 75 V; 0,5 A |
| Connection cross-section, FM terminals | | 0,5 - 1,5 mm² |
| Connection cross-section, FM terminals | | 21 - 16 AWG |

# Surge protection for high-speed networks up to 1 GBit (Class ND-CAT6/E-F)

Alu

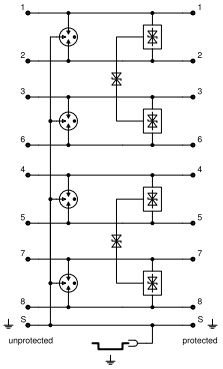

| Type | Version | Connection system | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **ND-CAT6/E-F** | Fine protection, 8 wires + shield | RJ45 8(8) | 1 | **5081802** |

Data cable protection device for high-speed networks
- High-quality RJ45 sockets
- Low protection level at high current load
- Earthing via DIN rail or connection cable
- Support of Power over Ethernet ++ (PoE++/4PPoE) to 1 A in accordance with IEEE 802.3
- Tested transmission quality in networks up to 1 GBit/s (Class E) or CAT6
- Fast installation through plug-in version
- Incl. DIN rail fastening set and earthing cable

Application example: 1 GBit Ethernet, 10/100 MBit Ethernet, PoE applications, IP camera systems, ISDN S0 interfaces

| **ND-CAT6/E-F** | | |
|---|---|---|
| Maximum continuous voltage AC | $U_C$ | 41 V |
| Maximum continuous voltage DC | $U_C$ | 58 V |
| Category | | Type 2+3 / C2+C1 |
| Lightning protection zone LPZ | | 1→3 |
| Channel performance ISO/IEC | | Class E |
| Channel performance Ansi/EA | | CAT 6 |
| Number of poles | | 8 |
| Rated current | $I_L$ | 1 A |
| Impulse durability wire-wire | | C1: 0,3 kV / 0,15 kA (8/20µs) |
| Impulse durability wire-earth | | C2: 3 kV / 1,5 kA (8/20µs) |
| Total discharge current (8/20) | | 5 kA |
| Protection level wire-wire | | <40 V |
| Protection level wire-earth | | <900 V |
| Frequency range | | 0 - 250 MHz |
| Temperature range | ϑ | -40 - +80 °C |
| Installation type | | Connector/cable adapter |
| Connection system | | RJ45 8(8) |
| Protection rating | | IP20 |
| Shielding connection available | | Yes |
| Shield connection | | Direct |
| Earthing via: | | Connection cable / DIN rail |
| Testing standard | | IEC 61643-21 |

**Connection options**






Always indicate the item number when ordering.

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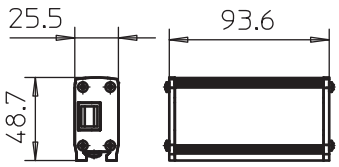
# Surge protection for high-speed networks up to 1 GBit (Class ND-CAT6/E-B)



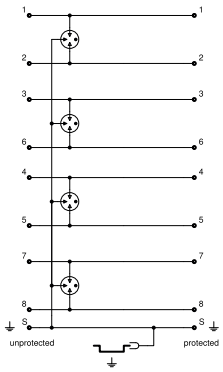


Data cable protection device for high-speed networks
- Protection class: Basic protection
- High-quality RJ45 sockets
- Low protection level at high current load
- Earthing via DIN rail or connection cable
- Support of Power over Ethernet ++ (PoE++/4PPoE) to 1 A in accordance with IEEE 802.3
- Tested transmission quality in networks up to 1 GBit/s (Class E) or CAT6
- Rapid installation through plug-in version
- Incl. DIN rail fastening set and earthing cable

Application example: 1 GBit Ethernet, 10/100 MBit Ethernet, PoE applications, IP camera systems, ISDN S0 interfaces

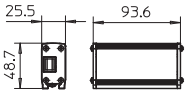
| Type | Version | Connection system | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **ND-CAT6/E-B** | Basic protection, 8 wires + shield | RJ45 8(8) | 1 | | **5081804** |

## Connection options




| ND-CAT6/E-B | | |
|---|---|---|
| Maximum continuous voltage AC | $U_C$ | 46 V |
| Maximum continuous voltage DC | $U_C$ | 65 V |
| Category | | Type 1 / D1 |
| Lightning protection zone LPZ | | 0→1 |
| Channel performance ISO/IEC | | Class E |
| Channel performance Ansi/EA | | CAT 6 |
| Number of poles | | 8 |
| Rated current | $I_L$ | 1 A |
| Impulse durability wire-wire | | C2: 3 kV / 1,5 kA (8/20µs) |
| Impulse durability wire-earth | | C2: 3 kV / 1,5 kA (8/20µs) |
| Total discharge current (8/20) | | 10 kA |
| Protection level wire-wire | | <1100 V |
| Protection level wire-earth | | <900 V |
| Frequency range | | 0 - 250 MHz |
| Temperature range | ϑ | -40 - +80 °C |
| Installation type | | Connector/cable adapter |
| Connection system | | RJ45 8(8) |
| Protection rating | | IP20 |
| Shielding connection available | | Yes |
| Shield connection | | Direct |
| Earthing via: | | Connection cable / DIN rail |
| Testing standard | | IEC 61643-21 |

# Surge protection for high-speed networks up to 10 GBit (Class EA/CAT6A)

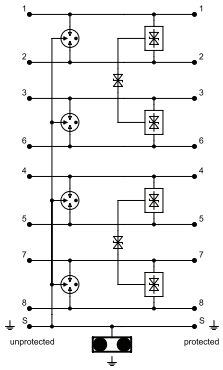



| Type | Version | Connection system | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **ND-IP66-RJ-RJ** | Fine protection, 8 wires + shield | RJ45 8(8) | 1 | | **5081807** |
| **ND-IP66-RJ-LSA** | Combined protection, 8 wires + shield | RJ45 8(8) | 1 | | **5081808** |

Data cable protection device for high-speed networks
- Protection class: Fine protection
- Unprotected connection: RJ45 socket
- Protected connection: RJ45 socket
- Low voltage protection level at a high current load
- Earthing via external PE connection
- Support for Power over Ethernet ++ (PoE++/4PPoE) up to 1 A according to IEEE 802.3
- Tested transmission quality in networks to 10 GBit (class EA) or CAT6A
- For wall and mast mounting indoors and outdoors
- Robust aluminium housing, protection rating IK code: IK08, protection type: IP66
- Voltage protection level PoE: <160 V

Application example: 10 GBit Ethernet, 10/100 MBit Ethernet, PoE applications, IP camera systems, high-quality industrial systems

## Connection options

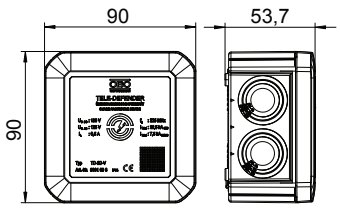



| | | |
|---|---|---|
| **ND-IP66-RJ-RJ** | | |
| Maximum continuous voltage DC | $U_C$ | 58 V |
| Category | | Type 1+2+3 / D1+C2+C1 |
| Lightning protection zone LPZ | | 1→3 |
| Channel performance ISO/IEC | | Class EA |
| Channel performance Ansi/EA | | CAT 6A |
| Number of poles | | 8 |
| Rated current | $I_L$ | 1 A |
| Impulse durability wire-wire | | C1: 0,5 kV / 0,25 kA (8/20µs) |
| Impulse durability wire-earth | | C2: 3 kV / 1,5 kA (8/20µs) |
| Total discharge current (8/20) | | 10 kA |
| Protection level wire-wire | | <70 V |
| Protection level wire-earth | | <700 V |
| Frequency range | | >500 MHz |
| Temperature range | ϑ | -20 - +65 °C |
| Installation type | | Wall mounting |
| Connection system | | RJ45 8(8) |
| Protection rating | | IP66 |
| Shielding connection available | | Yes |
| Shield connection | | Direct |
| Earthing via: | | Connection cable |
| Testing standard | | IEC 61643-21 |
| **ND-IP66-RJ-LSA** | | |
| Maximum continuous voltage DC | $U_C$ | 58 V |
| Category | | Type 1+2+3 / D1+C2+C1 |
| Lightning protection zone LPZ | | 1→3 |
| Channel performance ISO/IEC | | Class EA |
| Channel performance Ansi/EA | | CAT 6A |
| Number of poles | | 8 |
| Rated current | $I_L$ | 1 A |
| Impulse durability wire-wire | | C1: 0,5 kV / 0,25 kA (8/20µs) |
| Impulse durability wire-earth | | C2: 5 kV / 2,5 kA (8/20µs) |
| Total discharge current (8/20) | | 10 kA |
| Protection level wire-wire | | <70 V |
| Protection level wire-earth | | <700 V |
| Frequency range | | >500 MHz |
| Temperature range | ϑ | -20 - +65 °C |
| Installation type | | Wall mounting |
| Connection system | | RJ45 8(8) |
| Protection rating | | IP66 |
| Shielding connection available | | Yes |
| Shield connection | | Direct |
| Earthing via: | | Connection cable |
| Testing standard | | IEC 61643-21 |



Always indicate the item number when ordering.

# Combination protection device TD-2D-V for VDSL systems





Data cable protection device for telecommunications equipment

- Low protection level at a high current load
- "Push-in" clamps for quick installation
- Bandwidth-optimised for secure transmission up to 225 MHz
- Surface mounting

Application: Ideal for all DSL systems, IP connections, ISDN or analogue telecommunications

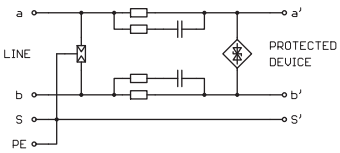
Data cable protection device for telecommunications equipment

- Low protection level at a high current load
- "Push-in" clamps for quick installation
- Bandwidth-optimised for secure transmission up to 225 MHz
- Surface mounting

Application: Ideal for all DSL systems, IP connections, ISDN or analogue telecommunications

| Type | Max. continuous voltage AC V | Max. continuous voltage DC V | Number of poles | Connection system | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|---|
| **TD-2D-V** | 125 | 180 | 2 | Terminal | 1 | | **5081698** |

## Connection options



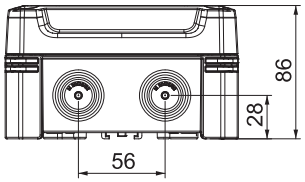

| TD-2D-V | | |
|---|---|---|
| Maximum continuous voltage AC | $U_C$ | 125 V |
| Maximum continuous voltage DC | $U_C$ | 180 V |
| Category | | Type 1+2+3 / D1+C2+C1 |
| Lightning protection zone LPZ | | 0→3 |
| Number of poles | | 2 |
| Rated current | $I_L$ | 0.5 A |
| Capacity (wire-wire) | | <10 pF |
| Capacity (wire-earth) | | <20 pF |
| Series resistance per wire | | 2,2 Ω ± 5 % |
| Impulse durability wire-wire | | C2: 15 kV / 7,5 kA (8/20µs) |
| Impulse durability wire-earth | | C2: 15 kV / 7,5 kA (8/20µs) |
| Impulse discharge current (10/350) | $I_{imp}$ | 2.5 kA |
| Total discharge current (8/20) | | 22,5 kA |
| Total discharge current (10/350) | | D1: 7,5 kA |
| Protection level wire-wire | | <350 V |
| Protection level wire-earth | | <600 V |
| Frequency range | | 0 - 225 MHz |
| Insertion loss | $S_{21}$ | ≤3 dB |
| Temperature range | ϑ | -40 - +80 °C |
| Installation type | | Surface-mounted |
| Connection system | | Terminal |
| Protection rating | | IP54 |
| Shielding connection available | | Yes |
| Connection cross-section, flexible | | 0.14 - 1 mm² |
| Connection cross-section, multi-wire | | 0.14 - 1 mm² |
| Connection cross-section, rigid | | 0.08 - 1.5 mm² |
| Testing standard | | IEC 61643-21 |

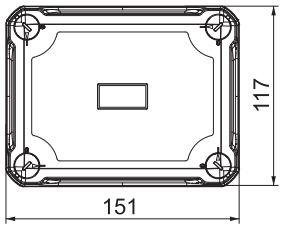
## Junction box X 06 with hat profile rail

| Type | Colour | Entries | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **X06 R LGR-TR** | Grey/transparent | 4 x Ø20/25, 4 x Ø20/25/32 | 1 | | **2005092** |

Junction box with hat profile rail for the connection of cables and lines indoors and in outdoor areas. Rectangular design with knock-out entries. Suitable for wall and ceiling mounting with the option to fasten outside, inside or to mount via the corner domes. Particularly impact resistant with IK09. Transparent cover with quick lock, sealable. Made from halogen-free and UV-resistant materials.
With hat profile rail type 2069.
Junction box according to DIN EN 60670. Flame-resistant to DIN EN 60695/2/11, test temperature 650 °C. Impact resistance IK09 according to DIN EN 50102. Protection rating IP67 according to DIN EN 60529.

### Dimensions




| Type | Dimension LxWxH mm | Clear internal dimensions mm |
|---|---|---|
| X06 R LGR-TR | 151x117x86 | 137x105x68 |



Always indicate the item number when ordering.

PC

# Junction box X 10 with hat profile rail

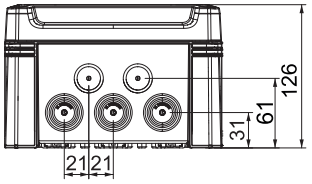
| Type | Colour | Entries | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **X10 R LGR-TR** | Grey/transparent | 10 x Ø20/25/32 | 1 | **2005096** |

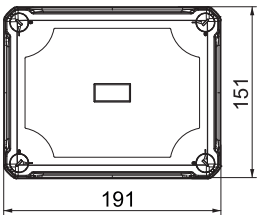
Junction box with hat profile rail for the connection of cables and lines indoors and in outdoor areas. Rectangular design with knock-out entries. Suitable for wall and ceiling mounting with the option to fasten outside, inside or to mount via the corner domes. Particularly impact resistant with IK09. Transparent cover with quick lock, sealable. Made from halogen-free and UV-resistant materials.
With hat profile rail type 2069.
Junction box according to DIN EN 60670. Flame-resistant to DIN EN 60695/2/11, test temperature 650 °C. Impact resistance IK09 according to DIN EN 50102. Protection rating IP67 according to DIN EN 60529.

With transparent cover and hat profile rail, type 2069, with fastening set.

| Type | Dimension LxWxH mm | Clear internal dimensions mm |
|---|---|---|
| X10 R LGR-TR | 191x151x126 | 177x137x110 |

**Dimensions**



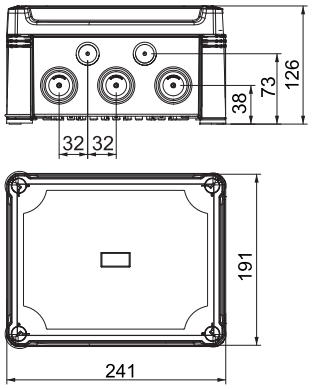
## Junction box X 16 with hat profile rail

| Type | Colour | Entries | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **X16 R LGR-TR** | Grey/transparent | 10 x Ø25/32/40 | 1 | | **2005100** |

Junction box with hat profile rail for the connection of cables and lines indoors and in outdoor areas. Rectangular design with knock-out entries. Suitable for wall and ceiling mounting with the option to fasten outside, inside or to mount via the corner domes. Particularly impact resistant with IK09. Transparent cover with quick lock, sealable. Made from halogen-free and UV-resistant materials.
With hat profile rail type 2069.
Junction box according to DIN EN 60670. Flame-resistant to DIN EN 60695/2/11, test temperature 650 °C. Impact resistance IK09 according to DIN EN 50102. Protection rating IP67 according to DIN EN 60529.

With transparent cover and hat profile rail, type 2069, with fastening set.

### Dimensions




| Type | Dimension LxWxH mm | Clear internal dimensions mm |
|---|---|---|
| X16 R LGR-TR | 241x191x126 | 227x177x110 |



Always indicate the item number when ordering.

PC

## Junction box X 25 with hat profile rail

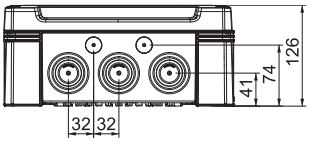
| Type | Colour | Entries | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **X25 R LGR-TR** | Grey/transparent | 10 x Ø25/40/50 | 1 | **2005104** |

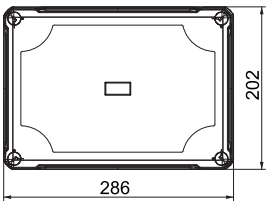
Junction box with hat profile rail for the connection of cables and lines indoors and in outdoor areas. Rectangular design with knock-out entries. Suitable for wall and ceiling mounting with the option to fasten outside, inside or to mount via the corner domes. Particularly impact resistant with IK09. Transparent cover with quick lock, sealable. Made from halogen-free and UV-resistant materials.
With hat profile rail type 2069.
Junction box according to EN 60670. Flame-resistant to EN 60695/2/11, test temperature 650 °C. Impact resistance IK09 according to EN 50102. Protection rating IP67 according to EN 60529.

With transparent cover and hat profile rail, type 2069, with fastening set.

| Type | Dimension LxWxH mm | Clear internal dimensions mm |
|---|---|---|
| X25 R LGR-TR | 286x202x126 | 271x187x110 |

**Dimensions**




PC

## Distribution box, 12 division units, with terminal strip

| Type | Colour | Dimension LxWxH mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **SDB 12 PC** | Light grey | 286x202x126 | 1 | **2008852** |

Distribution box with terminal strip for surface mounting, for the current sub-distribution in interior and exterior areas, in accordance with IEC 439-3. With pre-mounted 35 mm hat profile rail. IP66 protection type and IK08 protection rating. Transparent cover to screw on, with cut-out.
- Protection-insulated for a maximum of 12 division units
- Terminal strip set consisting of: One each of: PE/N terminal (1x25 mm² and 1x16 mm² screw terminals, 2x4 mm² and 12x2.5 mm² screwless terminals), mini hat profile rail, mounting instructions and fastening set
- Identification plates for connected consumers
- 8 elastic cable entries Ø20 mm for cable diameters of 0–17 mm
- 1 elastic cable entry Ø25 mm for cable diameters of 0–22 mm
- 1 elastic cable entry Ø32 mm for cable diameters of 0–28 mm
- 10 Ø 20 mm break-out openings each at the top and bottom
- 1 Ø 20/25/32 mm combination break-out opening each at the top and bottom
- 4 screw cover caps
- 2 stainless steel external fastenings
- Cover strips for unused division units

# Earthing systems

## Elementary for effective lightning protection

In Germany, a foundation earth electrode complying to DIN 18014 must be installed for new buildings with on-roof PV systems without a lightning protection system. In the case of on-roof PV systems with a lightning protection system, the requirements of VDE 0185-305-3 (IEC/ EN 62305-3) must be taken into account (earthing resistance < 10 Ohm). With freestanding PV systems, the requirements of VDE 0185-305-3 (IEC/EN 62305-3) must also be taken into account. Here, a distinction between two earthing types must be made.

## Earthing systems, type A

Type A earthing systems include, for example, screw and ram foundations, if they correspond to the requirements of VDE 0185-561-2 (IEC/EN 62561-2). Here, not only a minimum cross-section must be maintained according to the selected material, but also mechanical and electrical properties as well.

## Earthing systems, type B

Plate and strip foundations are appropriate type B earthing systems. According to VDE 0185-305-3, Supplement Sheet 5, they have a reduced earth impact and should be expanded using additional earthing measures such as grid earth electrodes (20 m x 20 m) or earth rods.


| | |
|---|---|
| 1 | Type: OMEX |
| 2 | Type: BP |
| 3 | Type: Standard |
| 4 | Type: LightEarth |

*Earth rod versions*

For both cases, OBO's portfolio contains suitable earth rods of Ø 20 mm or Ø 25 mm and wires of Ø 10 mm, as well as strips of various dimensions, such as 30 x 3.5 mm or 40 x 4 mm.

In the case of foundations with reinforcement steel, a tin-plated or copper-plated earth electrode in the earth is not permitted. In the earth, a high-alloy stainless steel with a molybdenum content of at least 2%, such as those in the material nos. 1.4401, 1.4404 or 1.4571, must be used. This is primarily neutral towards other, more or less precious materials, thus guaranteeing a high system availability.

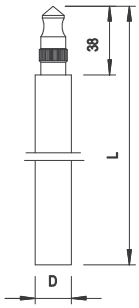
## Functional earthing of metallic substructures

To guarantee functional earthing of metallic substructures or module underframes, VDE 0185-305-3, Supplement Sheet 5, distinguishes between the following situations:

| Situation | Minimum cross-section, copper functional earthing |
|---|---|
| PV system without lightning protection system or PV system with lightning protection system and the separation distance is maintained | 6 mm² |
| PV system with lightning protection system and the separation distance is not maintained | 16 mm² |

## Earth rod V4A 20 mm

A4

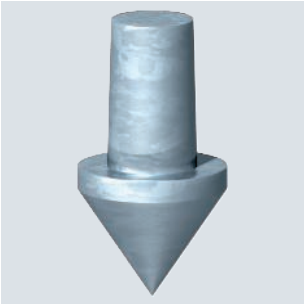


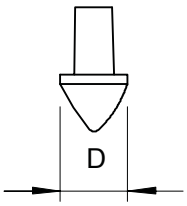

| Type | Length mm | External Ø mm | Short-circuit current (50 HZ) (1 s;≤300 °C) kA | Lightning current carrying capacity kA | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|---|
| **219 20 BP V4A** | 1500 | 20 | 4.2 | H1/150 | 5 | **5000866** |

- "BP" system (Bundespost)
- Very good contacting properties with soft metal inlay in the bore hole
- With peg and bore for linking together
- Conforms to the requirements according to VDE 0185-305 (IEC 62305) and DIN EN 62561-2
- Short circuit current Ik (50 Hz), time 1 s, max. temp. 300 °C: 4.5 kA (219 20 BP V4A)

## Driving spike for ST and BP earth rod

SG FT



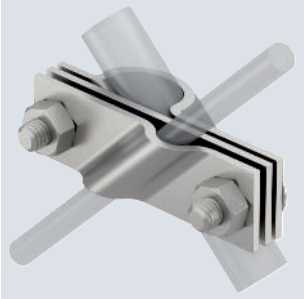


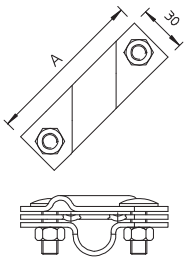

| Type | For earth rods Ø mm | Dim. D mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|
| **1819 20BP** | 20 | 20 | 5 | **3041212** |

- Suitable for ST and BP system

## Connection clamp for earth rod, universal

A4



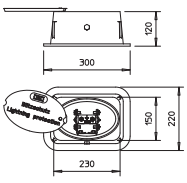



| Type | Dim. A mm | For earth rods Ø mm | Fit mm | Min. ordering quantity Piece | Item no. |
|---|---|---|---|---|---|
| **2760 20 V4A** | 101 | 20 | Rd 8-10/FL40 | 5 | **5001633** |

- Meets the requirements of VDE 0185-305-3 (IEC/ EN 62305-3)
- Suitable for connecting round conductors Rd 8-10 or flat conductors to FL 40
- With adapter plate
- Mounted with 2 hexagonal bolts M10 x 30 and 2 hexagonal bolts M10

## Inspection pit with integrated separation piece

EN-GJL




| Type | Min. ordering quantity Piece | Item no. |
|---|---|---|
| **5700 SP** | 1 | **5106003** |

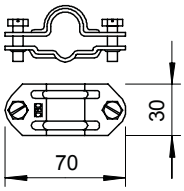
- Without base
- Cast iron, painted black
- With built-in cut-off unit for round conductors Rd 8-10 and flat conductors to FL 40
- To VDE 0185-561-5 (IEC 62561-5) suitable for heavy loads (up to 40 kN/4.0 t)

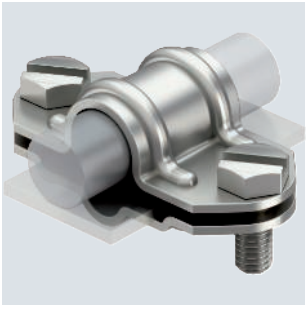
A2

## Universal separating piece

| Type | Fit mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **226 VA** | Rd 8-10/FL30 x 16 | 10 | | **5336058** |

- For fitting round conductors Rd 8–10 to Rd 16 or flat conductors FL30
- Including 2 hexagonal bolts M8 x 20 high-grade stainless steel (V2A)
- Conforms to the requirements according to VDE 0185-305 (IEC 62305)



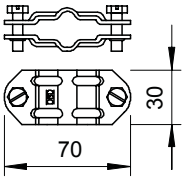



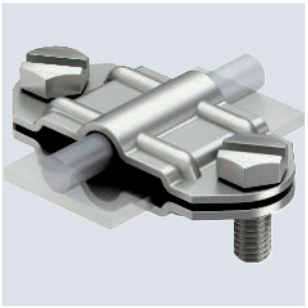
A2

## Separating piece for Rd 8–10 and FL 30 mm

| Type | Fit mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **233 VA** | Rd 8-10/FL30 x Rd 8-10/FL30 | 10 | | **5336341** |

- For fitting of round conductor Rd 8–10 or flat conductor FL 30
- Including 2 hexagonal bolts M8 x 20 made from rustproof stainless steel (VA)



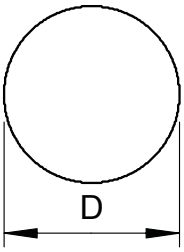



A4

## Round conductor, stainless steel

| Type | Nominal size Ø mm | Cross-section mm² | Normal ring ca. m | Normal ring ca. kg | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|---|---|
| **RD 10-V4A 20** | 10 | 78 | 20 | 12 | 20 | | **5021640** |
| **RD 10-V4A** | 10 | 78 | 50 | 32 | 50 | | **5021642** |
| **RD 10-V4A** | 10 | 78 | 80 | 50 | 80 | | **5021647** |

- According to DIN EN 62561-2 (VDE 0185-561-2)
- Corresponds to the requirements of VDE 0185-305 (IEC 62305)
- RD 10-V4A for applications in the earth
- According to the foundation earth electrode standard DIN 18014, V4A is required in the earth

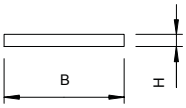



A4

## Stainless steel flat conductor A4

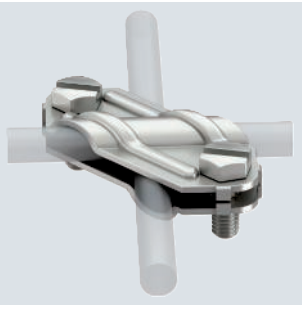
| Type | Dim. B mm | Dim. H mm | Cross-section mm² | Normal ring ca. kg | Min. ordering quantity m | | Item no. |
|---|---|---|---|---|---|---|---|
| **5052 V4A 30X3.5** | 30 | 3.5 | 105 | 42 | 50 | | **5018706** |
| **5052 V4A 30X3.5** | 30 | 3.5 | 105 | 21 | 25 | | **5018730** |

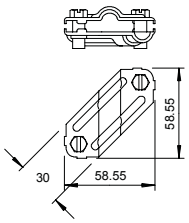
- According to DIN EN 62561-2 (VDE 0185-561-2)
- Corresponds to the requirements of VDE 0185-305 (IEC 62305)
- According to the foundation earth electrode standard DIN 18014, V4A is required in the earth
- For use in areas at risk of corrosion
- For lightning protection, earthing systems and ring equipotential bonding




## Cross-connector for flat conductors and round conductors

A4



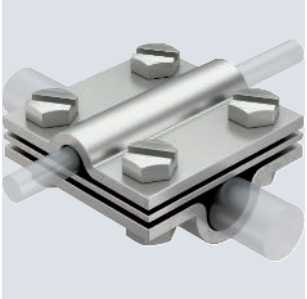


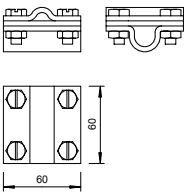

| Type | Fit mm | Lightning current carrying capacity kA | Short-circuit current (50 HZ) (1 s;≤300 °C) kA | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|---|
| **250 V4A** | Rd 8-10/FL30 | H/100 | 1.4 | 10 | | **5312925** |

- Meets the requirements of VDE 0185-305-3 (IEC/ EN 62305-3)
- Fit: Rd 8-10 x Rd 8-10
- Fit: Rd 8-10 x FL 30
- Fit: FL 30 x FL 30
- Mounted with 2 hexagonal bolts M8 x 20

## Cross-connector with intermediate plate for Rd 8–10 x Rd 16

A4



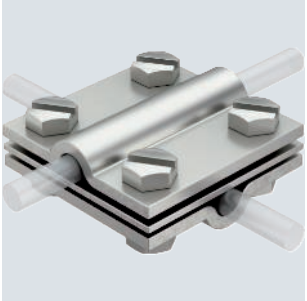


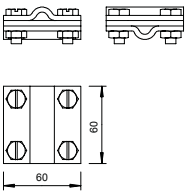

| Type | Fit mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **252 8-10x16 V4A** | Rd 8-10 x 16 | H/100 | 10 | | **5312346** |

- Meets the requirements of VDE 0185-305-3 (IEC/ EN 62305-3)
- Fit: Rd 8-10 x Rd 16 / FL 30
- With adapter plate
- Mounted with 4 hexagonal bolts M8 x 25 and 4 hexagonal nuts M8

## Cross-connector with intermediate plate for Rd 8–10 mm

A4



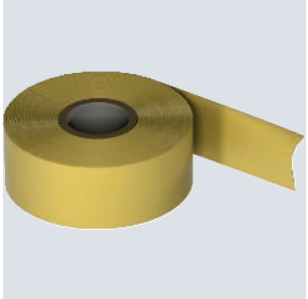


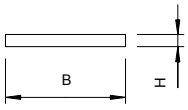

| Type | Fit mm | Lightning current carrying capacity kA | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **252 8-10 V4A** | Rd 8-10 | H/100 | 10 | | **5312318** |

- Meets the requirements of VDE 0185-305-3 (IEC/ EN 62305-3)
- Fit: Rd 8-10 x Rd 8-10 / FL 30
- With adapter plate
- Mounted with 4 hexagonal bolts M8 x 25 and 4 hexagonal nuts M8

## Corrosion protection strip

PETR






| Type | Width mm | Length m | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|---|
| **356 50** | 50 | 10 | 1 | | **2360055** |
| **356 100** | 100 | 10 | 1 | | **2360101** |

- Approx. 1.1 mm thick
- Width: 50 mm or 100 mm, made of petrolatum-coated chemical fibre fabric
- Can be processed cold



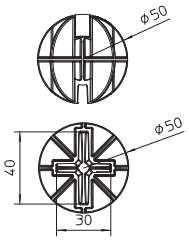
Always indicate the item number when ordering.

PE

## Protective cap for connection lugs, reflective

| Type | Fit mm | Min. ordering quantity Piece | | Item no. |
|---|---|---|---|---|
| **ProtectionBall** | RD 8-10/ FL 25/ 30/ 40 | 25 | | **5018014** |

- For snapping onto round conductors or flat conductors
- Noticeable, reflective label
- For accident protection during the construction phase

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# Katalog Allgemein PV

# en

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# Stand:  3/3/2026

# LLExport_03851

**Wenn LAGERLISTE:**
Dann in Leaflet die Variabel "Lagerliste_JaNein"
auf Ja
und

Alle Variablen:

| | |
|---|---|
| 01_Bestelltabellensteuerung_45860 | |
| 02_Masstabellensteuerung_45861 | |
| 03_GelisteteMerkmaleBelastungen_45520 | 45520 |
| 04_GelisteteMerkmaleAnschlMoegl_Benutzerdef_45519 | 377 |
| 05_GelisteteMerkmaleEinbauTabel_Benutzerdef_45521 | 45521 |
| 06_GelisteteMerkmaleKlassifikation_Datenblatt_4566 | 45662 |
| 07_Kunden_Artikelnummer_13190 | |
| 08_Kundenname_Tabellenkopf | |
| 09_KundenartikelnummerExtraZeile_JaNein | Nein |
| 10_Barcode_JaNein | Nein |
| 11_Landeskennzeichen_0A0B_JaNein | Nein |
| 12_Landeskennzeichen_0C_JaNein | Nein |
| 13_SelektionsCode_JaNein_45988_45990 | Nein |
| 14_LieferbarAb_JaNein_37860 | Nein |
| 15_GTIN_statt_Gewicht_VPE_JaNein | Nein |
| 5_Lagerliste_JaNein | Nein |
| 999_AbstandhalterHoehe | 1,2 |
| 999_ChalfantNrAnzeigen_JaNein | Nein |
| 999_ChalfantUmrechnung_JaNein | Nein |
| 999_EAN_ValAID_WennKeineSpKundenNr | 0 |
| 999_EinzugUntenObenProdTabelle | 0,5 |
| 999_Fabrikat_46153_JaNein | Nein |
| 999_InhaltsVerzAusSorter_JaNein | Nein |
| 999_Laenderkennzeichen_CID_QRCode | EN |
| 999_MasseUmrechnenImperial_JaNein | Nein |
| 999_Neues_CI_Seitenzahlen_JaNein | Ja |
| 999_ObjID_Translate_JaNein | Nein |
| 999_OfsetGriffmarkenAussen | 18 |
| 999_OfsetGriffmarkenInnen | |
| 999_Preis_ValAID | |
| 999_Preiseinheit_JaNein | Nein |
| 999_Rabattgruppen_JaNein | Nein |
| 999_SchnittmarkenJaNein | Ja |
| 999_StandardVPE | 1 |
| 999_StratID_statt_GTIN_in_IV_JaNein | Nein |
| 999_SystemZubehoer_JaNein | Nein |
| 999_ZeileWerkstoffRabattJaNein | Ja |
| 999_ZusText_Werkstoff_Lieferbar_auf_Anfrage_JaNein | Ja |
| 999_crossAct_Farbhinterlegung_JaNein | nein |
| _KatalogVersion_2020_JaNein | Ja |
| _nichtFuerPrintstrukturVerwenden_Ja=1Nein=0 | 1 |

Katalogdatei:
Q:\OBORD\260112 - Katalog Allgemein PV EN\In Bearbeitung\Leaflet\overlay_LL12_Katalog_2024_20240110_8-Ebenen_Version07_Standard_und_Neues-CI.tsl