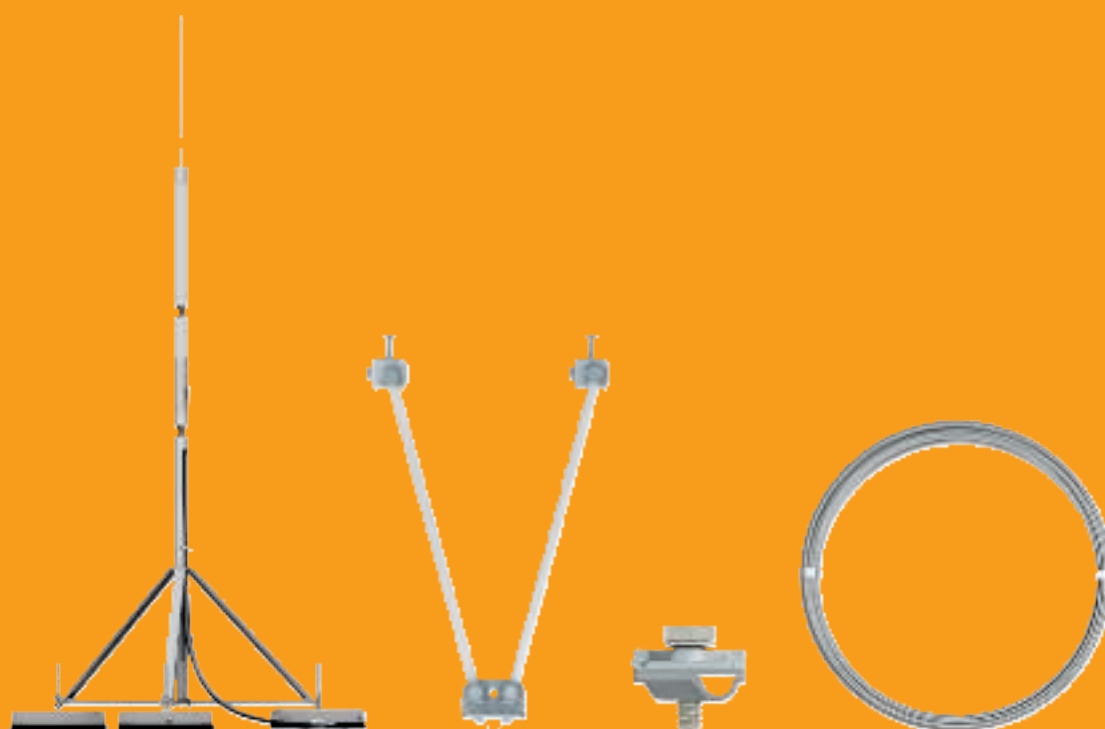


# Selection aid, external lightning protection

Components



## Necessity for a lightning protection system

Every year, lightning strikes put at risk – or cause harm to – people, animals and property. The amount of property damage with a high volume of damage is increasing continuously. This fact alone emphasises the importance of lightning protection systems. Building regulations mean that it is a legal requirement today that people must be protected against the impacts of lightning strikes. The infrastructure necessary for the execution of the work of public agencies, such as the police, ambulance and fire services, is also particularly worthy of protection.

Using the current standards as a basis, it is possible to determine whether a lightning protection system is necessary and how it must be designed. A determination of the economic viability can also be helpful when deciding for or against a lightning protection system. What costs are incurred if there is a possible lightning strike in a system without lightning protection, and, by contrast, how high are the investments in a lightning protection system?

The latest standards of the series IEC 62305-1...-4 (VDE 0185-305 Part 1-4) and the national supplementary sheets explain in technical terms how protective measures should be executed. Specialised components for lightning protection according to IEC 62561-1 (VDE 0185-561-1) are required for installing a lightning protection system.

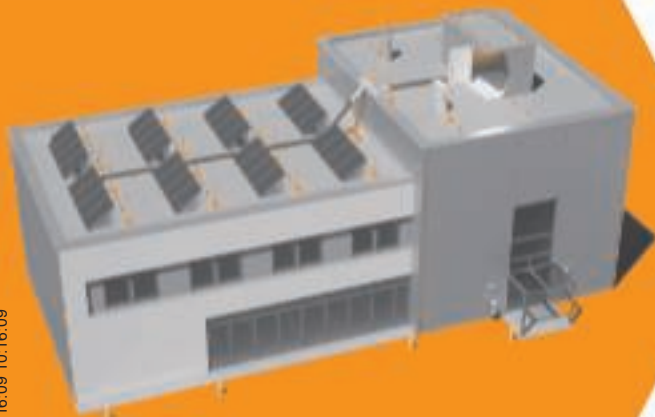
### **Note:**

Lightning protection equipotential bonding is an essential part of a complete lightning protection system. Besides suitable equipotential busbars (H/N), this also contains surge protection devices for the power supplies (type 1) and data, telecommunications, TV and MSR systems (D1).



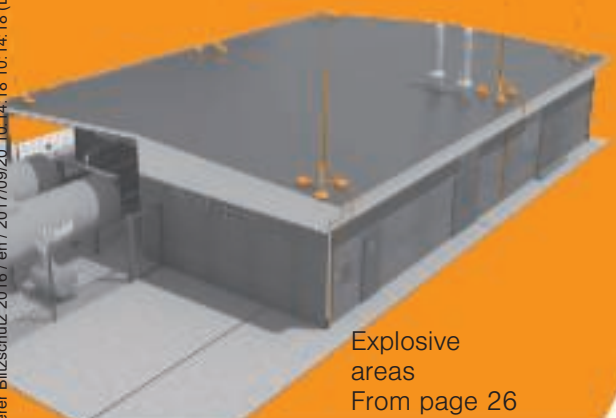
Pitched roofs  
From page 4

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| <b>Buildings with pitched roof</b> | <b>4</b> |
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Flat roofs  
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Explosive  
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## Buildings with pitched roof

Single-occupancy and multiple-occupancy dwellings, hotels, restaurants







## Creation of a lightning protection system

OBO can offer components for comprehensive lightning and surge voltage protection systems. Standard-compliant, tested components from OBO offer protection and safety of the highest order, not just for homes but also for industrial plants and potentially explosive areas.

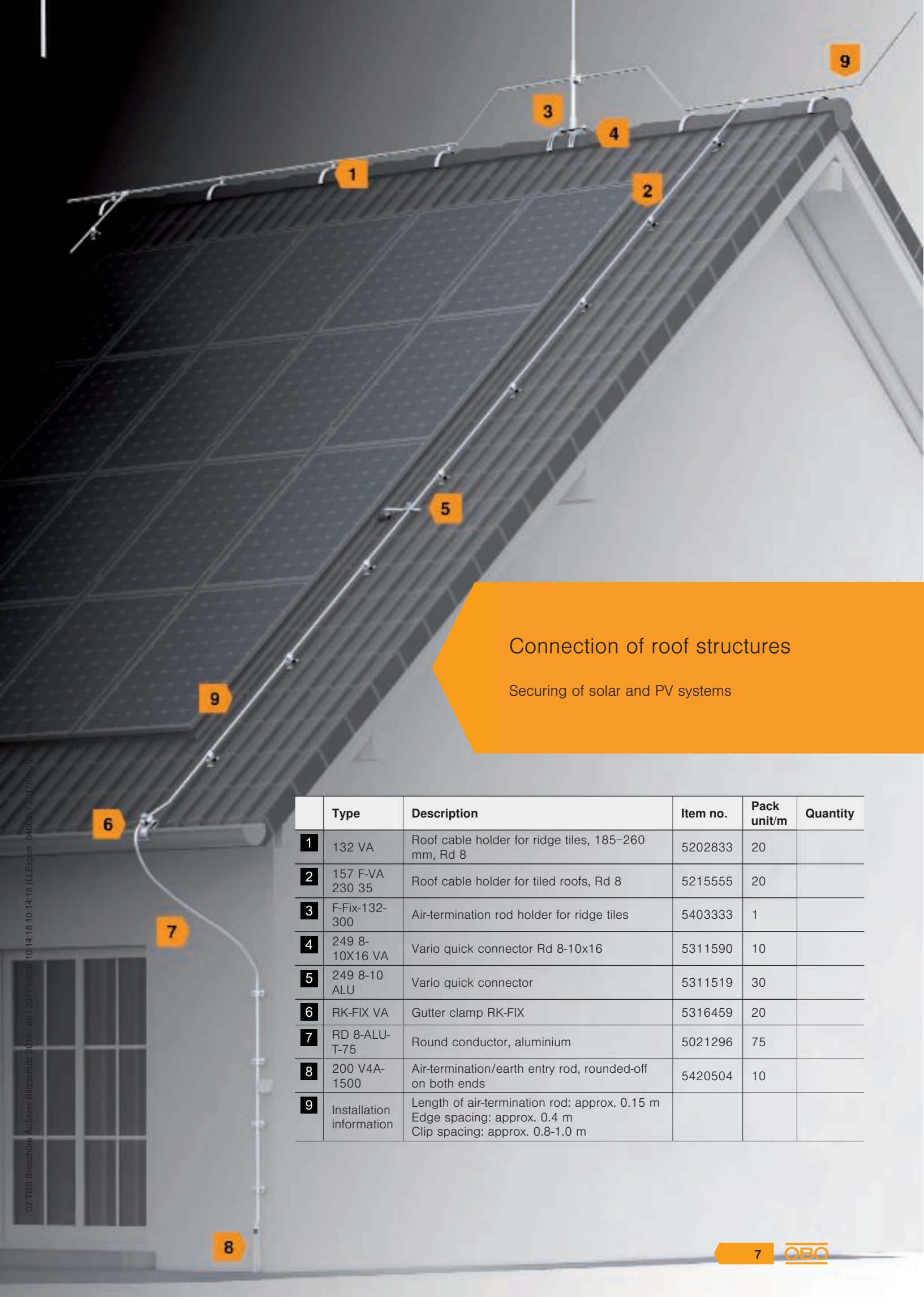
The external lightning protection system consists of the air-termination system, the conductors and the earthing system. If there is a direct lightning strike, the lightning protection system protects the building against a possible fire. The air-termination systems form protective spaces, the necessary size of which can be determined using, for example, the so-called "rolling sphere method". The air-termination systems provide optimal impact points which are then connected to the earthing system via the conductors. This creates a conductive path for the lightning currents into the ground, without creating sparks or arcing to other metallic installations.

The equipotential bonding system creates the connection into the building.

## Buildings with pitched roof

Single-occupancy and multiple-occupancy dwellings, hotels, restaurants

|   | Type            | Description  | Item no. | Pack unit/m | Quantity |
|---|-----------------|--|----------|-------------|----------|
| 1 | RD 8-ALU-T-75   | Round conductor, aluminium   | 5021296  | 75          |          |
| 2 | 157 F-VA 230 35 | Roof cable holder for tiled roofs, Rd 8                              | 5215555  | 20          |          |
| 3 | RK-FIX VA       | Gutter clamp RK-FIX  | 5316459  | 10          |          |
| 4 | 177 20 VA B-HD  | Screwless cable bracket for Rd 8 mm, fastening with screw and anchor | 5207901  | 50          |          |
| 5 | MK-B            | Magnetic card and holder MK-B  | 5091322  | 10          |          |
| + | LSC I+II        | Lightning current meter  | 5091722  | 1           |          |
| 6 | 226 VA          | Universal separating piece   | 5336058  | 10          |          |
| 7 | 200 V4A-1500    | Air-termination/earth entry rod, rounded-off on both ends            | 5420504  | 10          |          |
| 8 | 311 N-VA 16     | Number plates  | 3049329  | 5           |          |
| + | 113 Z-16        | Rod holder for 16 mm air-termination and earth entry rods            | 5412609  | 10          |          |



## Connection of roof structures

Securing of solar and PV systems

|   | Type                     | Description   | Item no. | Pack unit/m | Quantity |
|---|--------------------------|---|----------|-------------|----------|
| 1 | 132 VA                   | Roof cable holder for ridge tiles, 185–260 mm, Rd 8   | 5202833  | 20          |          |
| 2 | 157 F-VA 230 35          | Roof cable holder for tiled roofs, Rd 8   | 5215555  | 20          |          |
| 3 | F-Fix-132-300            | Air-termination rod holder for ridge tiles  | 5403333  | 1           |          |
| 4 | 249 8-10X16 VA           | Vario quick connector Rd 8-10x16  | 5311590  | 10          |          |
| 5 | 249 8-10 ALU             | Vario quick connector   | 5311519  | 30          |          |
| 6 | RK-FIX VA                | Gutter clamp RK-FIX   | 5316459  | 20          |          |
| 7 | RD 8-ALU-T-75            | Round conductor, aluminium  | 5021296  | 75          |          |
| 8 | 200 V4A-1500             | Air-termination/earth entry rod, rounded-off on both ends   | 5420504  | 10          |          |
| 9 | Installation information | Length of air-termination rod: approx. 0.15 m<br>Edge spacing: approx. 0.4 m<br>Clip spacing: approx. 0.8-1.0 m |          |             |          |



# Architecturally high-quality build-ings

Buildings with thatched roof

|   | Type           | Description   | Item no. | Pack unit/m | Quantity |
|---|----------------|---|----------|-------------|----------|
| 1 | isFang IN 4000 | isFang, insulated air-termination rod for inner-routed isCon ® conductor<br>Roof routing, fastening and sealing according to the roof shape | 5408934  | 1           |          |
| 2 | 1809           | Equipotential busbar with plastic base plate  | 5015073  | 1           |          |
| 3 | isCon ® 750 SW |   | 5408002  | 25          |          |
| 4 | SQ-20 SW-OBO   | starQuick cable bracket PA<br>Fastening spacing approx. 0.5-0.8 m   | 2146164  | 50          |          |
| 5 | isCon connect  | Connection element  | 5408022  | 2           |          |
| 6 | 223 O DIN ZN   | Separating piece, open  | 5335140  | 20          |          |
| 7 | 311 N-VA 8-10  | Number plates   | 3049221  | 5           |          |
| 8 | AF RD 10 V4A   | Connection lug/earth entry rod<br>made of stainless steel   | 5430720  | 5           |          |







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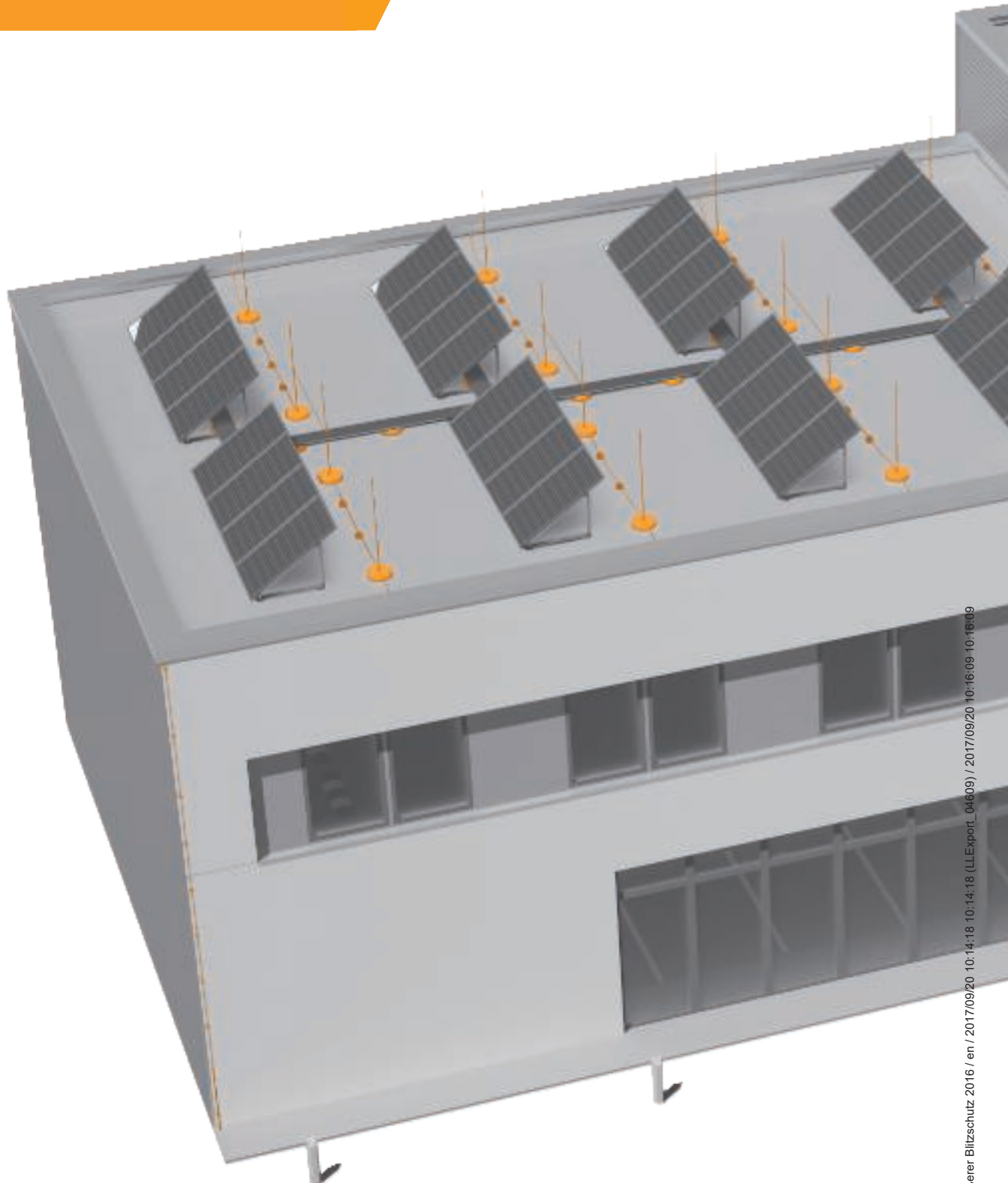
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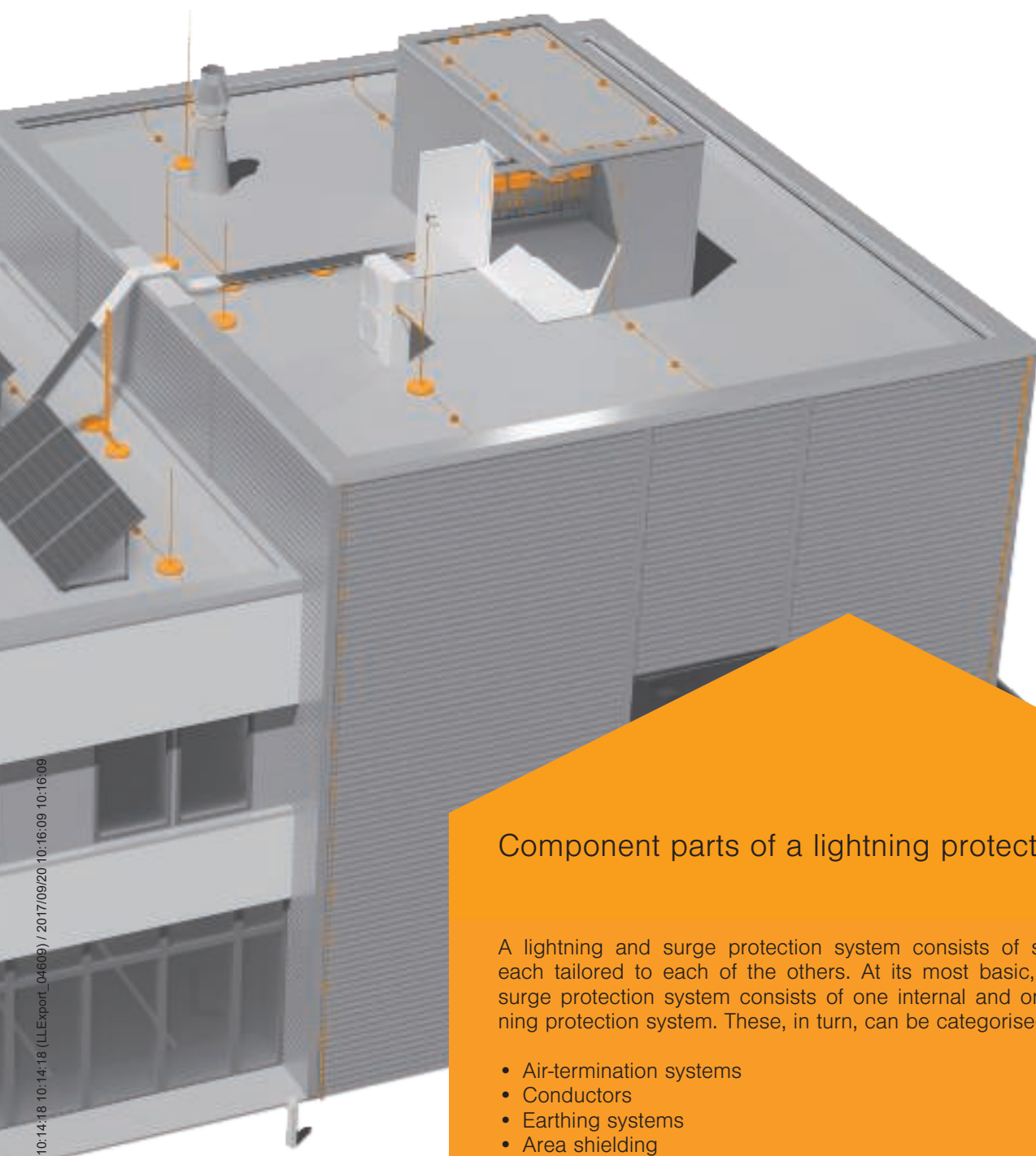
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## Buildings with flat roof

Industrial halls, distribution centres, office buildings, furniture stores





## Component parts of a lightning protection system

A lightning and surge protection system consists of several systems, each tailored to each of the others. At its most basic, a lightning and surge protection system consists of one internal and one external lightning protection system. These, in turn, can be categorised as follows:

- Air-termination systems
- Conductors
- Earthing systems
- Area shielding
- Separation distance
- Lightning protection equipotential bonding

These systems must be carefully selected for the application at hand, and used in a coordinated way. Installation of the systems takes place according to various application and product standards. The supplements to the international IEC guidelines and harmonised European versions of the various country-specific translations often contain additional informative information specific to the country in question.

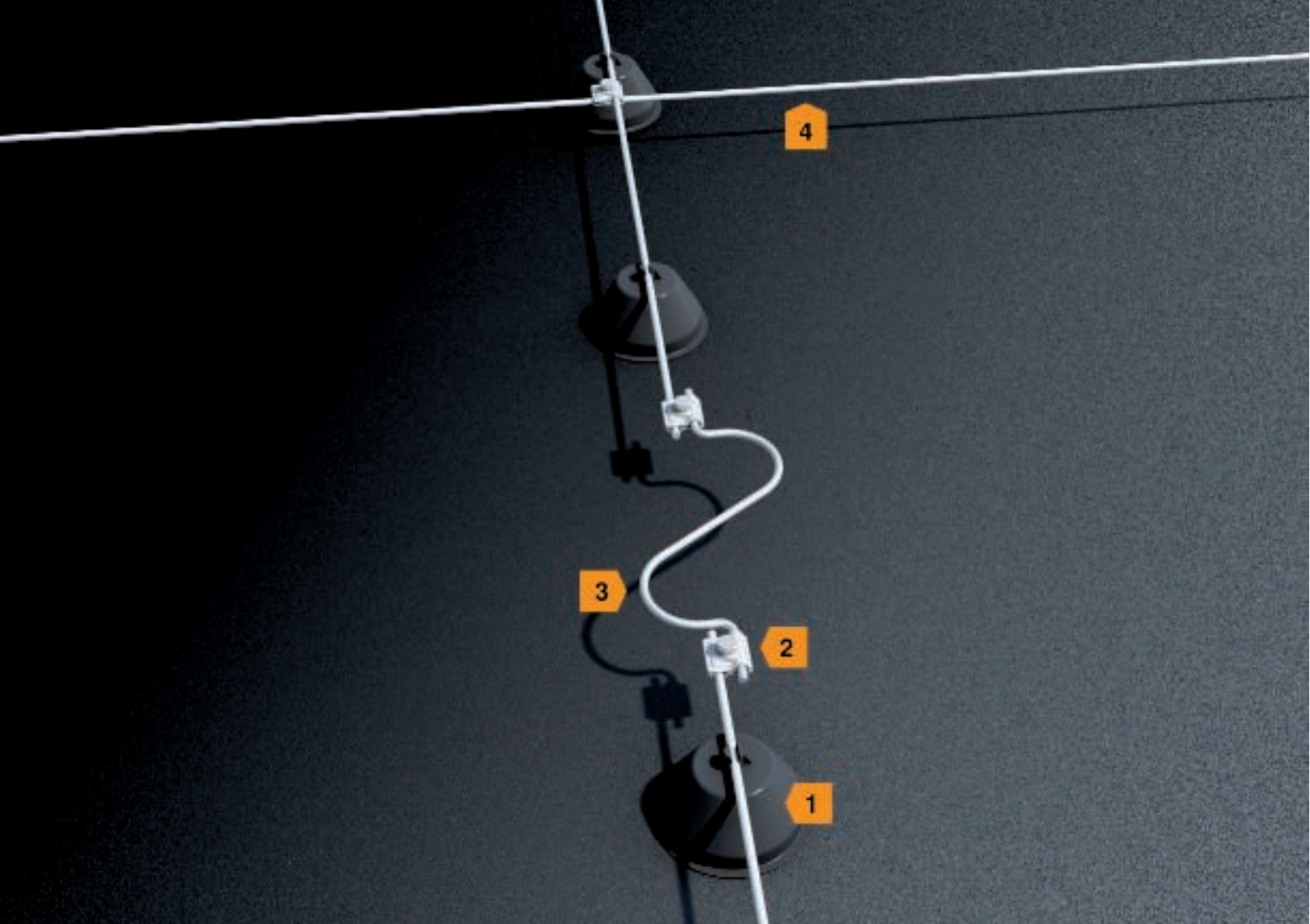




# Parapet

Connection of natural air-termination and arrest-  
ing systems

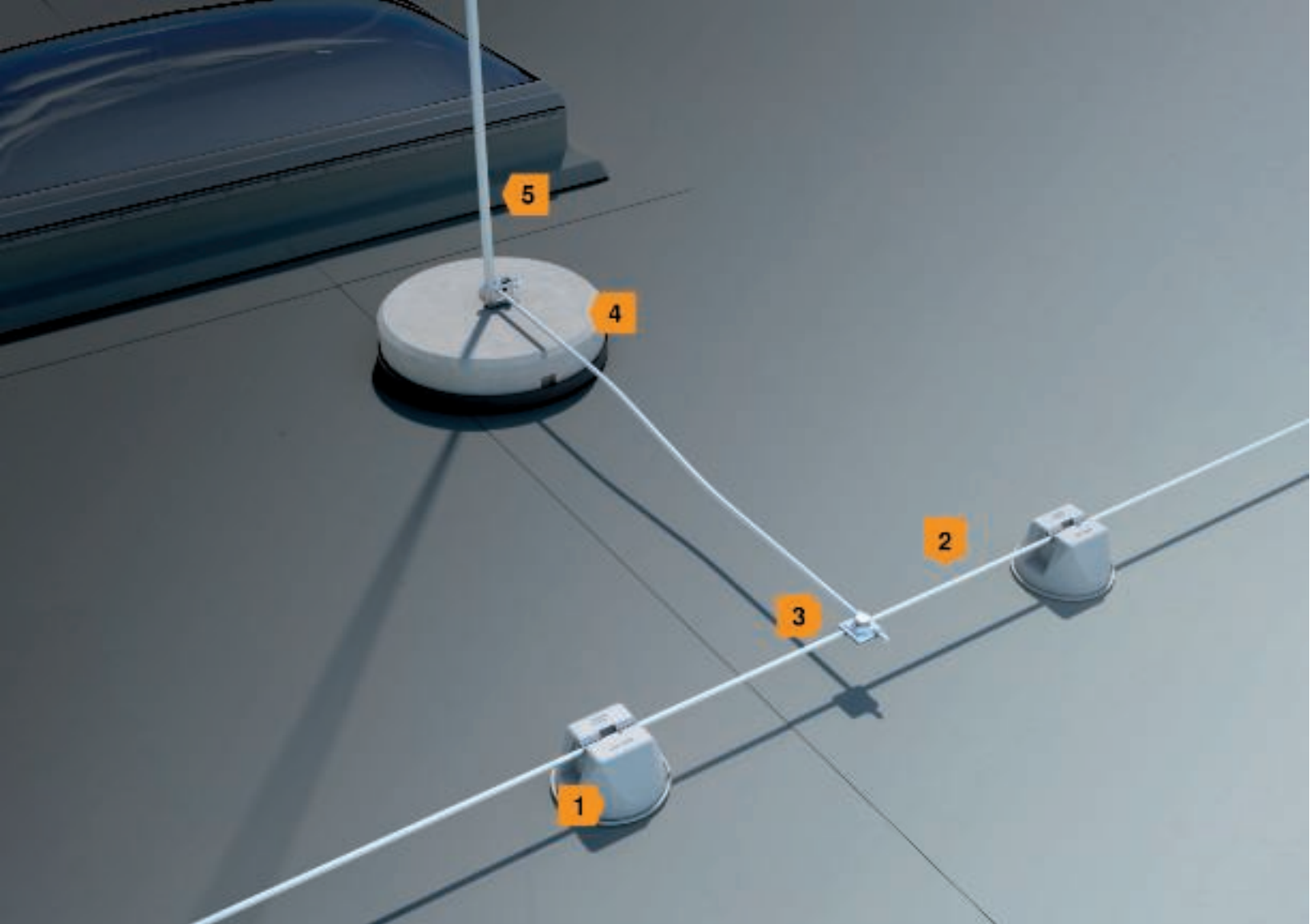
|   | Type          | Description                               | Item no. | Pack unit/m | Quantity |
|---|---------------|---|----------|-------------|----------|
| 1 | 165 MBG-8     | Roof cable holder for flat roofs          | 5218691  | 12          |          |
| 2 | RD 8-ALU-T-75 | Round conductor, aluminium                | 5021296  | 15          |          |
| 3 | 287 DCT       | Connection component with double crossbar | 5320707  | 10          |          |



## Flat roof/bitumen

Expansion compensation on flat roofs

|   | Type         | Description  | Item no. | Pack unit/m | Quantity |
|---|--------------|--|----------|-------------|----------|
| 1 | 165 KR       | Roof cable holder for flat roofs, plastic sleeve   | 5218861  | 50          |          |
| 2 | 249 8-10 ALU | Vario quick connector  | 5311519  | 30          |          |
| 3 | 172 AR       | Expansion piece  | 5218926  | 10          |          |
| 4 | RD 8-ALU     | Round conductor, aluminium<br>Expansion compensation for aluminium<br>approx. every 10 m | 5021286  | 150         |          |

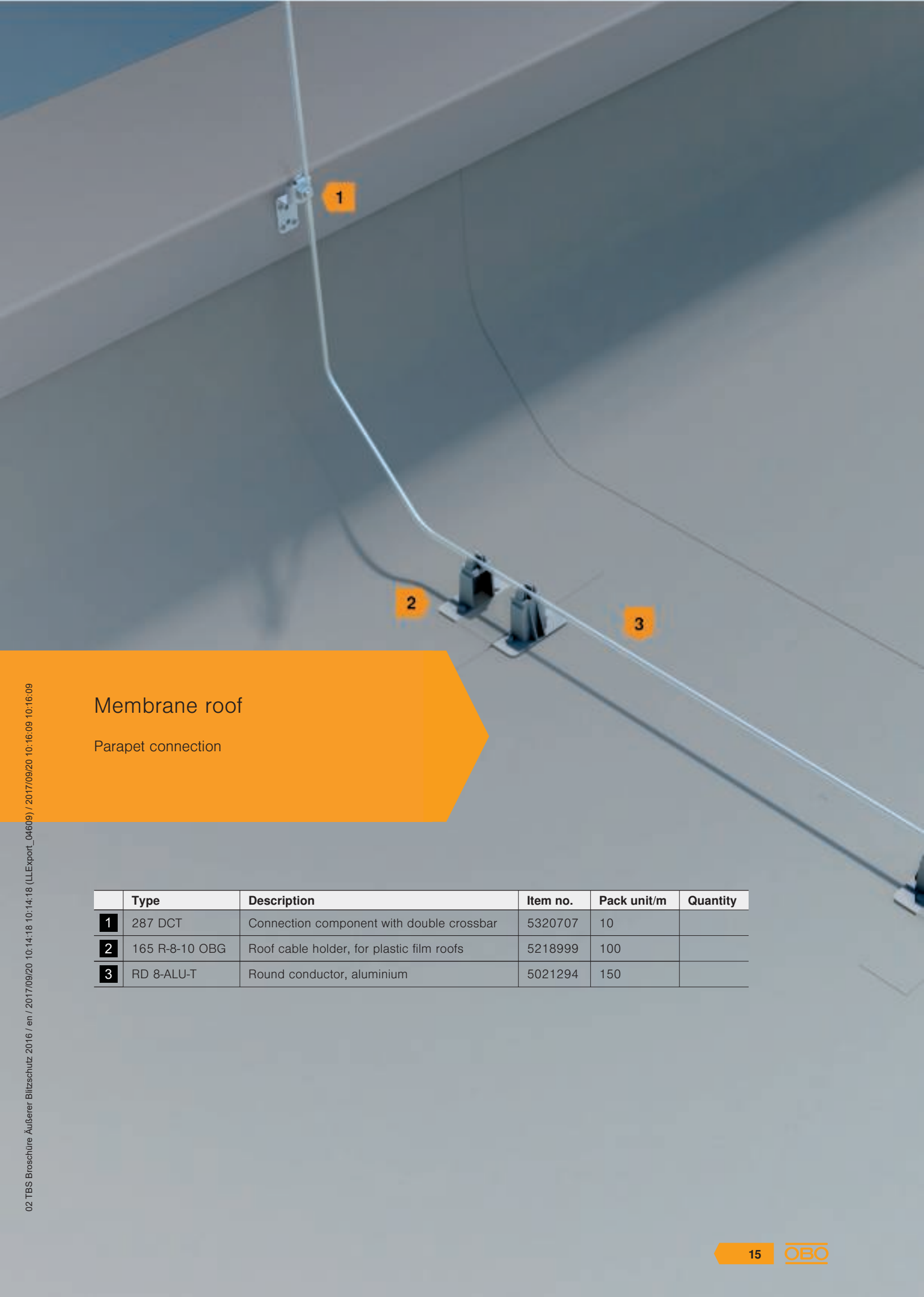


## Membrane roof

Protection of light domes or RWA systems

|   | Type          | Description                      | Item no. | Pack unit/m | Quantity |
|---|---------------|----------------------------------|----------|-------------|----------|
| 1 | MBG-8 GR      | Roof cable holder for flat roofs | 5218693  | 12          |          |
| 2 | RD 8-ALU-T 75 | Round conductor, aluminium       | 5021296  | 75          |          |
| 3 | 249 8-10 ALU  | Vario quick connector            | 5311519  | 30          |          |
| 4 | F-FIX-16      | Stand for FangFix system 16 kg   | 5403200  | 1           |          |
| 5 | 101 VL3000    | Tapered pipe air-termination rod | 5401989  | 10          |          |





# Membrane roof

Parapet connection

|   | Type           | Description                               | Item no. | Pack unit/m | Quantity |
|---|----------------|---|----------|-------------|----------|
| 1 | 287 DCT        | Connection component with double crossbar | 5320707  | 10          |          |
| 2 | 165 R-8-10 OBG | Roof cable holder, for plastic film roofs | 5218999  | 100         |          |
| 3 | RD 8-ALU-T     | Round conductor, aluminium                | 5021294  | 150         |          |



## Insulated lightning protection

Insulated sets

|   | Type        | Description  | Item no. | Pack unit/m | Quantity |
|---|-------------|--|----------|-------------|----------|
| 1 | 101 3-ES-16 | Insulated lightning protection set, 3-corner fastening | 5408976  | 1           |          |
| 2 | 101 FS-16   | Insulated lightning protection set, IR fastening       | 5408980  | 1           |          |
| 3 | 101 VS-16   | Insulated lightning protection set, V fastening        | 5408978  | 1           |          |
| 4 | 101 VRS-16  | Insulated lightning protection set, VRS fastening      | 5408982  | 1           |          |
| 5 | RD 8-ALU    | Round conductor, aluminium                             | 5021286  | 150         |          |
| + | RD 10-ALU   | Round conductor, aluminium                             | 5021308  | 95          |          |
| + | 101 VL3000  | Tapered pipe air-termination rod                       | 5401989  | 10          |          |

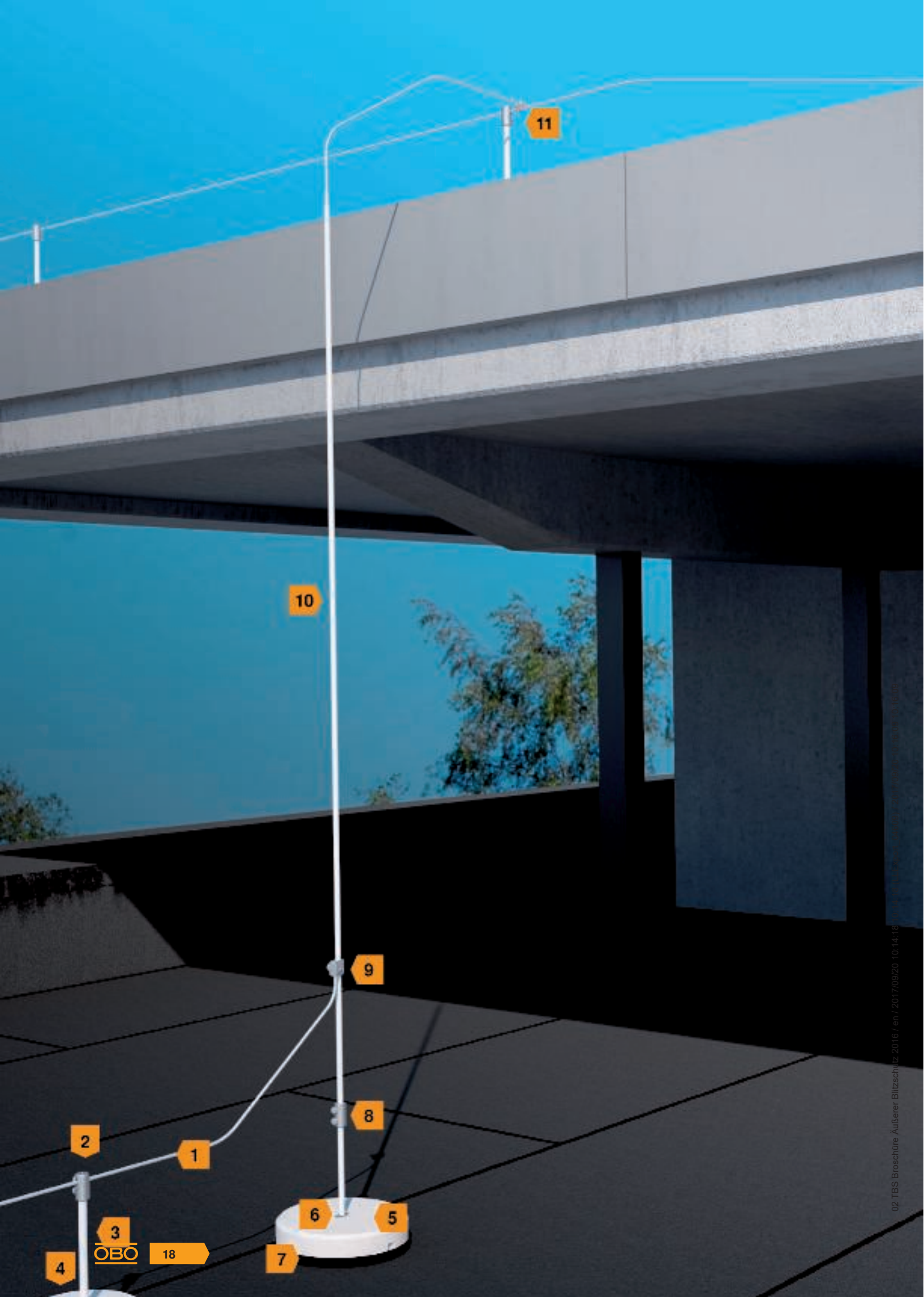


## Insulated lightning protection

Insulation crossbar

|   | Type       | Description   | Item no. | Pack unit/m | Quantity |
|---|------------|---|----------|-------------|----------|
| 1 | 165 MBG-8  | Roof cable holder for flat roofs, spacing approx. 1 m | 5218691  | 12          |          |
| 2 | F-FIX-10   | Stand for FangFix system 10 kg                        | 5403103  | 1           |          |
| 3 | 101 VL3500 | Tapered pipe air-termination rod                      | 5101993  | 10          |          |
| 4 | ISO-A-1030 | Insulated spacer                                      | 5408820  | 15          |          |





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OBO

# Insulated lightning protection

## Storey jump

|    | Type           | Description   | Item no. | Pack unit/m | Quantity |
|----|----------------|---|----------|-------------|----------|
| 1  | RD 8-ALU-T     | Round conductor, aluminium                                    | 5021294  | 150         |          |
| 2  | 101 IES-16     | End piece   | 5408395  | 10          |          |
| 3  | 101 16-750     | Insulating rod - 750 mm<br>For shortening to variable lengths | 5408107  | 5           |          |
| 4  | F-FIX-S10      | Concrete block for FangFix system 10 kg                       | 5403117  | 1           |          |
| +  | 101 RH-16      | FangFix reducing sleeve                                       | 5408101  | 25          |          |
| +  | F-FIX-B10      | Base for FangFix system 10 kg                                 | 5403124  | 10          |          |
| 5  | F-FIX-S16      | Concrete block for FangFix system 16 kg                       | 5403227  | 1           |          |
| 6  | 101 RH-16      | FangFix reducing sleeve                                       | 5408101  | 25          |          |
| 7  | F-FIX-B16      | Basis for FangFix system 16 kg                                | 5403235  | 10          |          |
| 8  | 101 IV-16      | Extension   | 5408557  | 10          |          |
| 9  | 249 8-10X16 VA | Vario quick connector Rd 8-10x16                              | 5311590  | 10          |          |
| 10 | 101 VL2500     | Tapered pipe air-termination rod                              | 5401986  | 10          |          |
| 11 | 249 8-10 ALU   | Vario quick connector   | 5311519  | 30          |          |

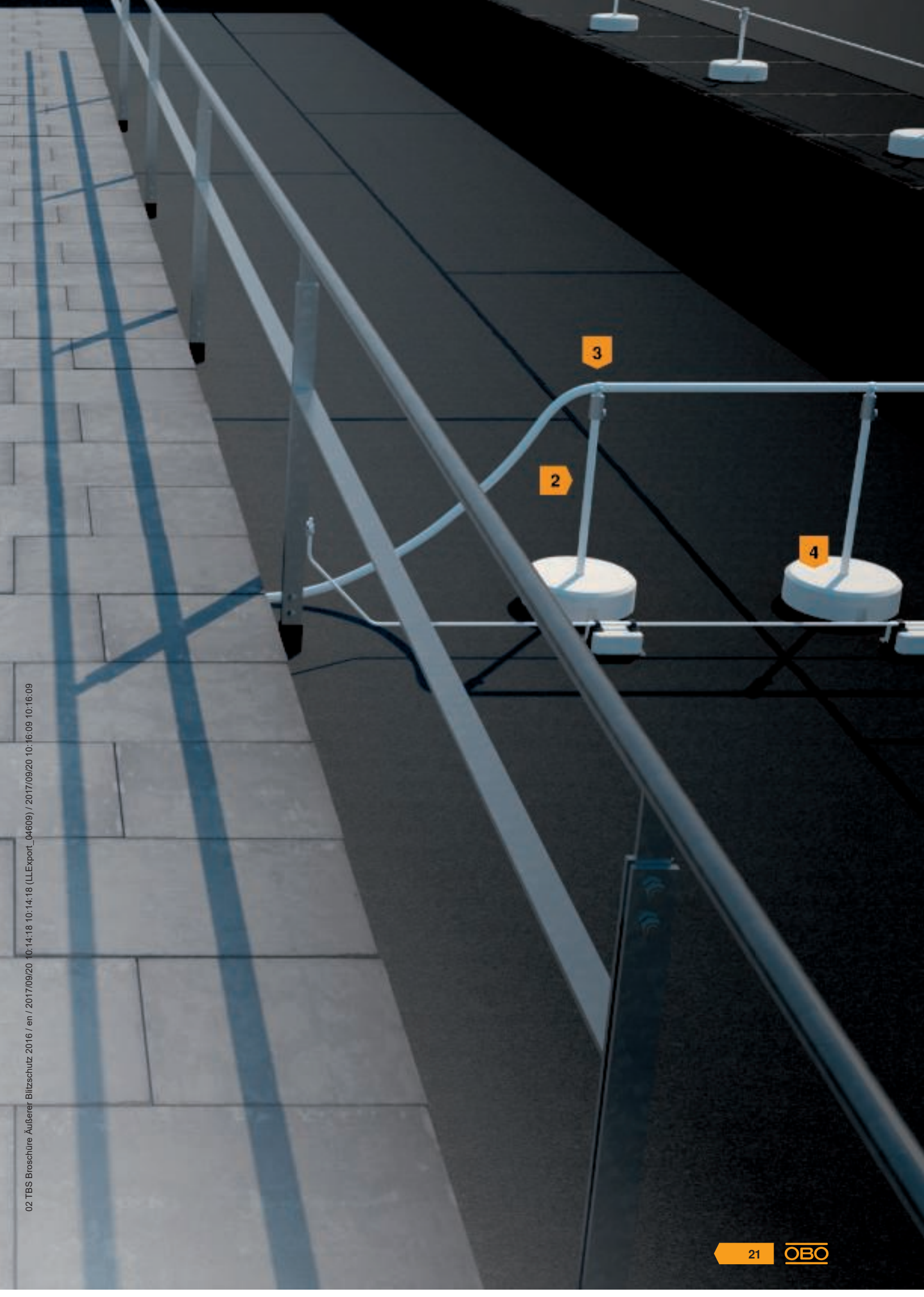


High-voltage-resistant,  
insulated conductor isCon®

Escape route/accessible flat roof

|   | Type          | Description   | Item no. | Pack unit/m | Quantity |
|---|---------------|---|----------|-------------|----------|
| 1 | isCon 750 LGR | isCon ® conductor in light grey                                 | 5407995  | 25          |          |
| 2 | 101 20-3000   | Insulating rod - 3,000 mm<br>For shortening to variable lengths | 5408105  | 5           |          |
| 3 | 101 IW-M10    | Wall connection   | 5408687  | 10          |          |
| + | isCon H 26VA  | VA cable bracket  | 5408064  | 20          |          |
| 4 | F-FIX-S10     | Concrete block for FangFix system 10 kg                         | 5403117  | 1           |          |
| + | F-FIX-B10     | Base for FangFix system 10 kg                                   | 5403124  | 10          |          |
| 5 | 165 R-8-10    | Roof cable holder for flat roofs, recyclable                    | 5218997  | 10          |          |
| 6 | 270 8-10 FT   | Folding clamp Rd 8-10 up to 10 mm plate<br>thickness            | 5317207  | 20          |          |
| 7 | 101 IES-16    | End piece   | 5408395  | 10          |          |

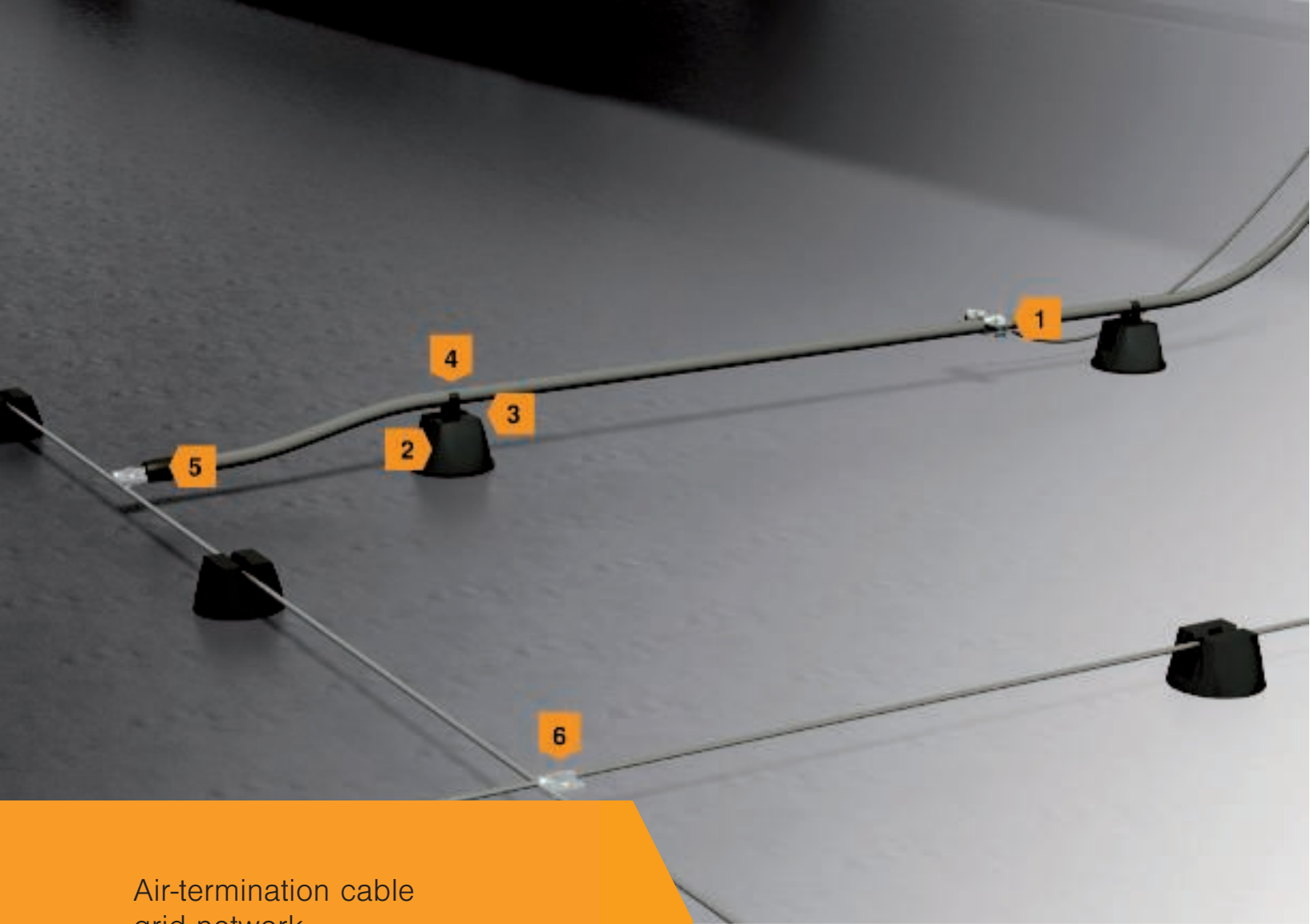




## Air-termination cable grid network

Insulated lightning protection

|   | Type          | Description   | Item no. | Pack unit/m | Quantity |
|---|---------------|---|----------|-------------|----------|
| 1 | 101 B2-16 M16 | Stand 16 kg with female thread                                  | 5402958  | 1           |          |
| 2 | 101 A-16      | Connection piece  | 5408352  | 10          |          |
| 3 | F-FIX-B16 3B  | Base for FangFix system 16 kg for mounting the isFang tripod    | 5403238  | 10          |          |
| 4 | 101 16-1500   | Insulating rod - 1,500 mm<br>For shortening to variable lengths | 5408108  | 5           |          |
| 5 | 101 W-16      | Wall connection   | 5408689  | 10          |          |
| 6 | 177 20 VA M8  | Screwless cable bracket for Rd 8 mm, through-way Ø 7 mm         | 5207347  | 20          |          |
| 7 | RD 8-ALU-T 75 | Round conductor, aluminium                                      | 5021296  | 75          |          |



## Air-termination cable grid network

Insulated lightning protection

|   | Type           | Description   | Item no. | Pack unit/m | Quantity |
|---|----------------|---|----------|-------------|----------|
| 1 | isCon PAE      | Potential connection                                  | 5408036  | 2           |          |
| 2 | 165 MBG-8      | Roof cable holder for flat roofs                      | 5218691  | 12          |          |
| 3 | 165 MBG UH     | Universal adapter for roof cable holder, type 165/MBG | 5218882  | 25          |          |
| 4 | M-Quick M25 SW | M-Quick cable bracket PA                              | 2153787  | 50          |          |
| 5 | isCon connect  | Connection element                                    | 5408022  | 2           |          |
| 6 | 249 B ALU      | Vario quick connector                                 | 5311713  | 100         |          |

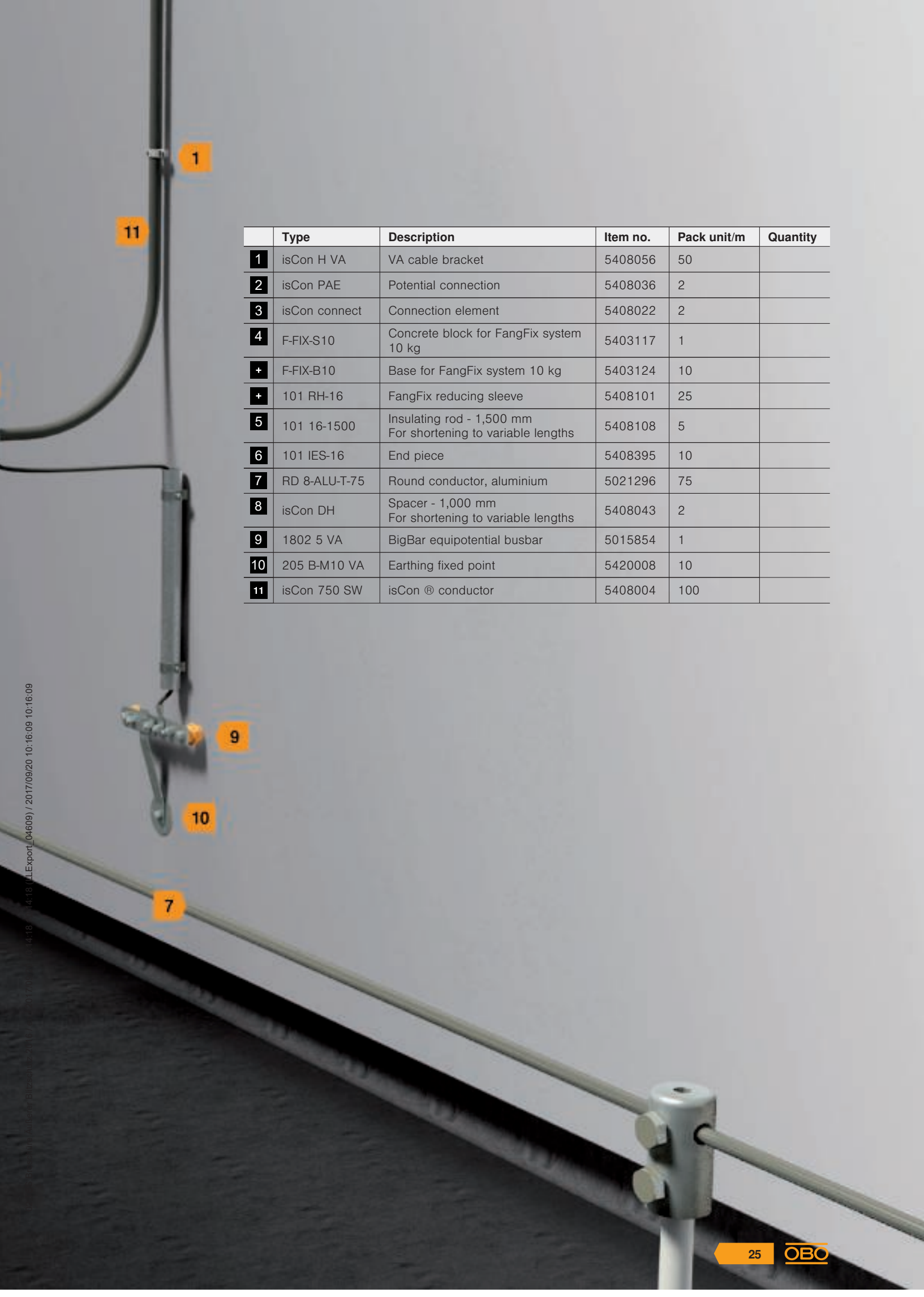


## High-voltage-resistant, insulated conductor isCon®

Connection to conventional insulated lightning  
protection



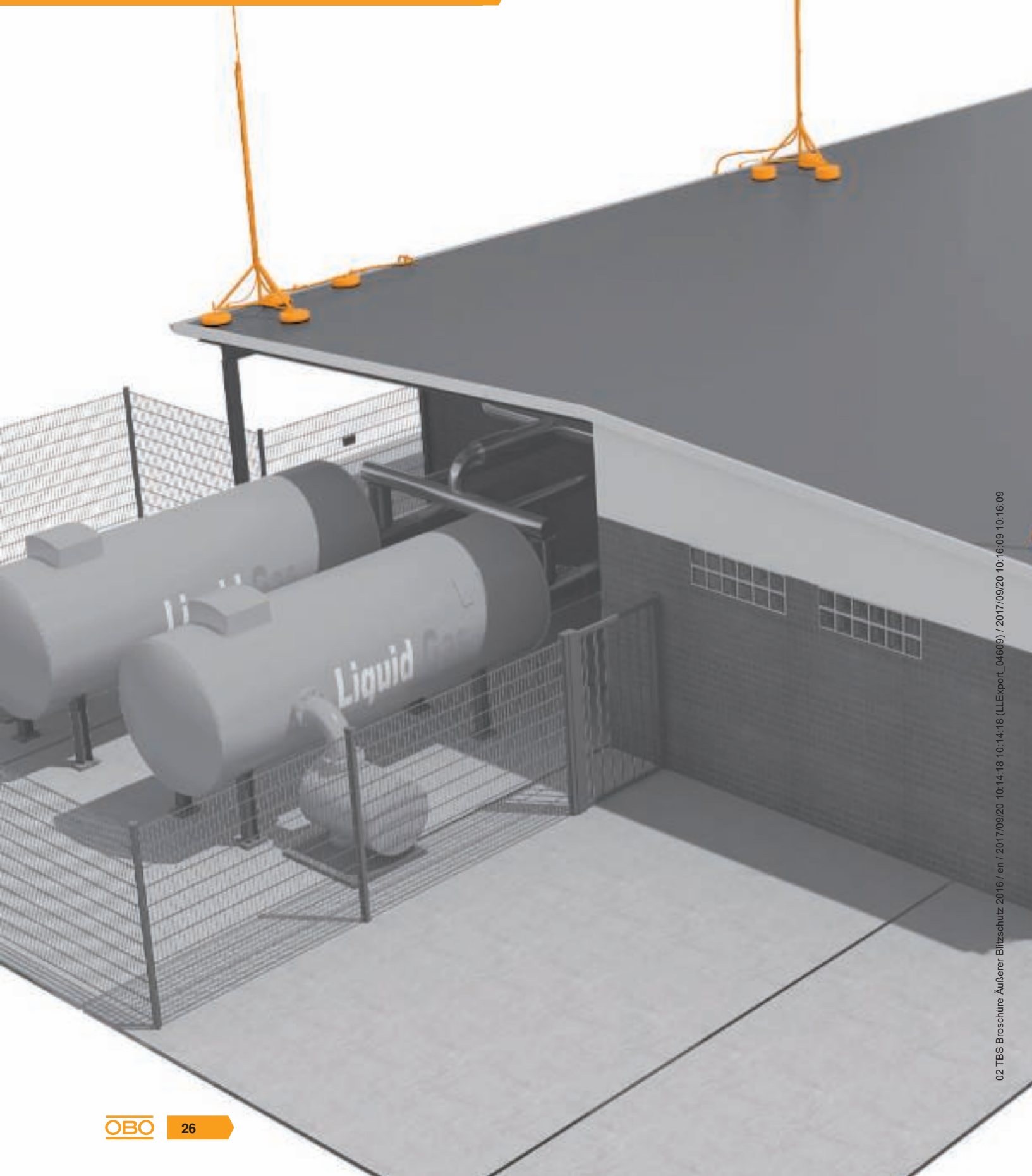


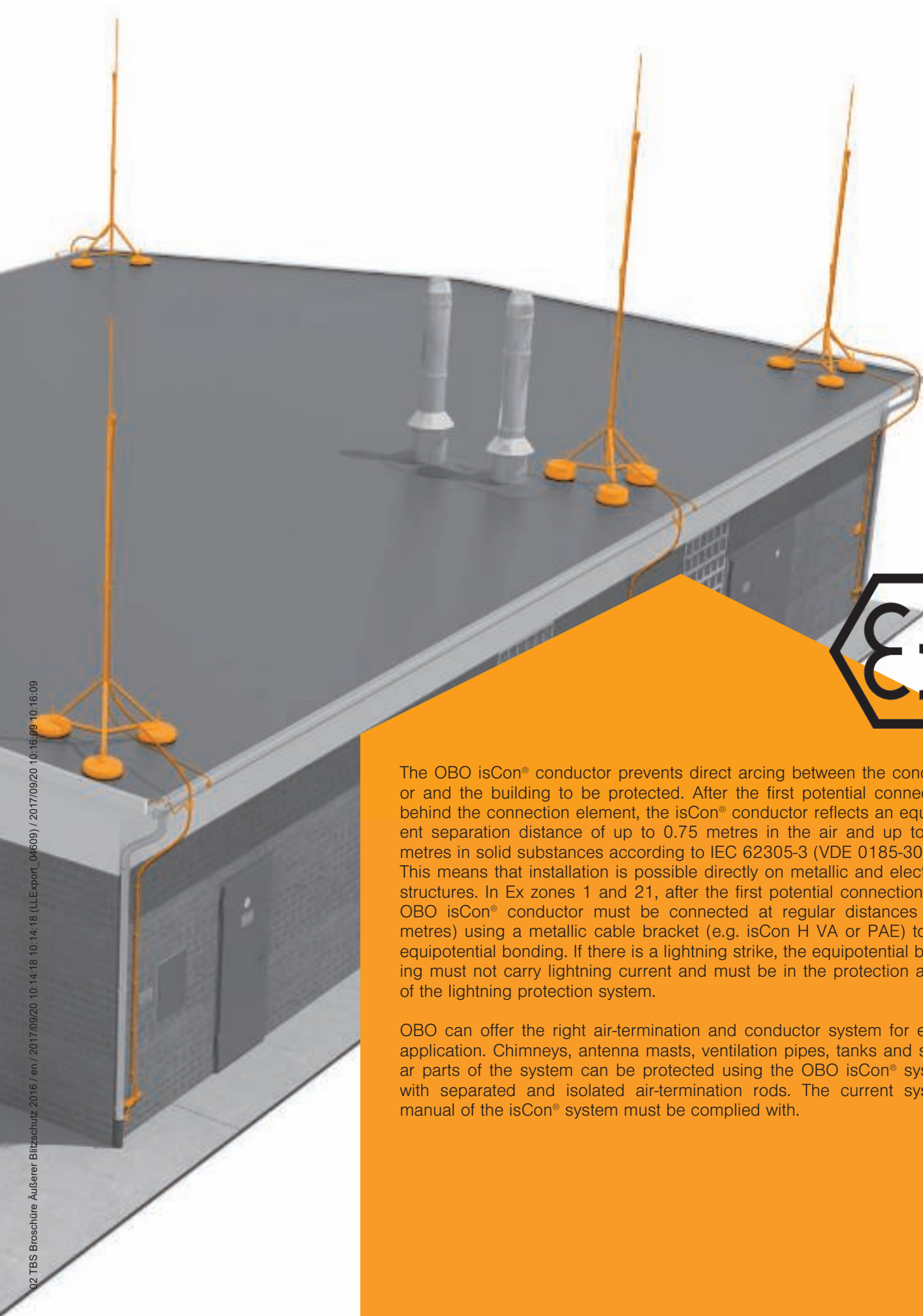


|    | Type          | Description   | Item no. | Pack unit/m | Quantity |
|----|---------------|---|----------|-------------|----------|
| 1  | isCon H VA    | VA cable bracket  | 5408056  | 50          |          |
| 2  | isCon PAE     | Potential connection  | 5408036  | 2           |          |
| 3  | isCon connect | Connection element  | 5408022  | 2           |          |
| 4  | F-FIX-S10     | Concrete block for FangFix system<br>10 kg                      | 5403117  | 1           |          |
| +  | F-FIX-B10     | Base for FangFix system 10 kg                                   | 5403124  | 10          |          |
| +  | 101 RH-16     | FangFix reducing sleeve   | 5408101  | 25          |          |
| 5  | 101 16-1500   | Insulating rod - 1,500 mm<br>For shortening to variable lengths | 5408108  | 5           |          |
| 6  | 101 IES-16    | End piece   | 5408395  | 10          |          |
| 7  | RD 8-ALU-T-75 | Round conductor, aluminium                                      | 5021296  | 75          |          |
| 8  | isCon DH      | Spacer - 1,000 mm<br>For shortening to variable lengths         | 5408043  | 2           |          |
| 9  | 1802 5 VA     | BigBar equipotential busbar                                     | 5015854  | 1           |          |
| 10 | 205 B-M10 VA  | Earthing fixed point  | 5420008  | 10          |          |
| 11 | isCon 750 SW  | isCon ® conductor   | 5408004  | 100         |          |

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## Explosive areas





The OBO isCon® conductor prevents direct arcing between the conductor and the building to be protected. After the first potential connection behind the connection element, the isCon® conductor reflects an equivalent separation distance of up to 0.75 metres in the air and up to 1.5 metres in solid substances according to IEC 62305-3 (VDE 0185-305-3). This means that installation is possible directly on metallic and electrical structures. In Ex zones 1 and 21, after the first potential connection, the OBO isCon® conductor must be connected at regular distances (0.5 metres) using a metallic cable bracket (e.g. isCon H VA or PAE) to the equipotential bonding. If there is a lightning strike, the equipotential bonding must not carry lightning current and must be in the protection angle of the lightning protection system.

OBO can offer the right air-termination and conductor system for every application. Chimneys, antenna masts, ventilation pipes, tanks and similar parts of the system can be protected using the OBO isCon® system with separated and isolated air-termination rods. The current system manual of the isCon® system must be complied with.



## High-voltage-resistant, insulated conductor isCon®

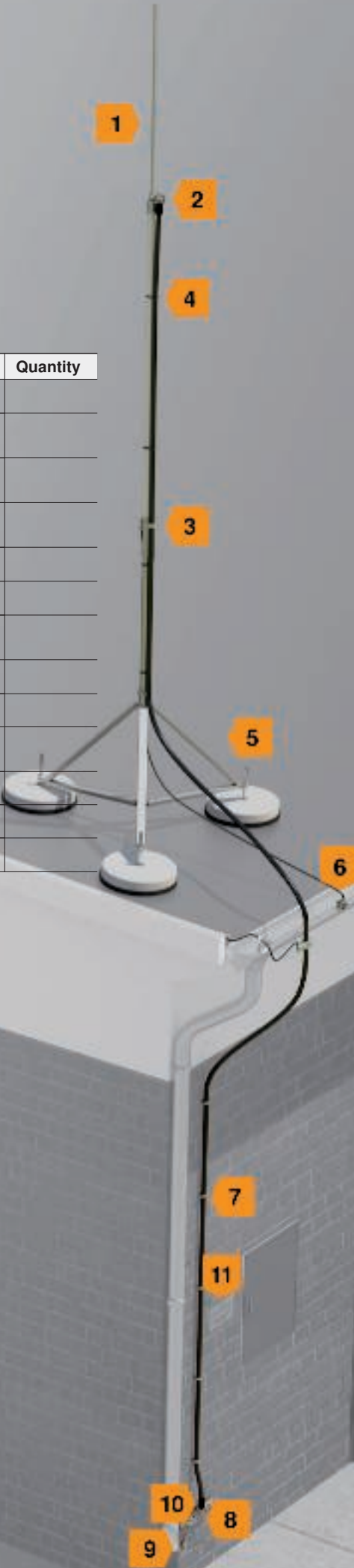
Wall mounting

|   | Type           | Description  | Item no. | Pack unit/m | Quantity |
|---|----------------|--|----------|-------------|----------|
| 1 | isFang IN 4000 | isFang, insulated interception rod for inner-routed isCon® conductor | 5408934  | 1           |          |
| 2 | isFang TW80    | isFang support for wall mounting, 80 mm spacing                      | 5408950  | 2           |          |
| 3 | isCon H VA     | Cable bracket  | 5408056  | 50          |          |
| + | 5052 V4A       | Flat conductor, stainless steel                                      | 5018706  | 1           |          |
| 4 | isCon connect  | Connection element   | 5408022  | 2           |          |
| 5 | EX PAS 5       | Equipotential busbar for EX zone 1/21, 2/22                          | 5015265  | 1           |          |
| 6 | MK-B           | Magnetic card and holder MK-B  | 5091322  | 10          |          |
| 7 | AF RD 10 V4A   | Connection lug/earth entry rod made of stainless steel (V4A)         | 5430720  | 5           |          |
| 8 | isCon HWS      | Information panel  | 5408058  | 1           |          |

# High-voltage-resistant, insulated conductor isCon®

Flat roof

|    | Type             | Description                                      | Item no. | Pack unit/m | Quantity |
|----|------------------|--|----------|-------------|----------|
| 1  | isFang 4000 AL   | Insulated air-termination rod                    | 5408943  | 1           |          |
| 2  | isCon AP1-16 VA  | Connection plate for two isCon® conductors       | 5408026  | 1           |          |
| 3  | 565 7.6x380 SWUV | Cable tie, black, UV and weather-resistant       | 2331924  | 100         |          |
| 4  | 927 2 6-K        | Potential connection clip for mounting on isFang | 5057599  | 10          |          |
| 5  | isFang 3B-100 AL | isFang air-termination rod stand                 | 5408966  | 1           |          |
| +  | isFang 3B-G1     | isFang-3B threaded rod                           | 5408971  | 3           |          |
| 3x | F-FIX-S16        | Concrete block for FangFix system 16 kg          | 5403227  | 1           |          |
| 6  | RK-FIX VA        | Gutter clamp RK-FIX                              | 5316459  |             |          |
| 7  | isCon H VA       | VA cable bracket                                 | 5408056  | 50          |          |
| 8  | EX PAS 5         | Equipotential busbar for EX zone 1/21, 2/22      | 5015265  | 1           |          |
| 9  | 5052 V4A 30X3.5  | Flat conductor, stainless steel                  | 5018706  | 50          |          |
| 10 | isCon connect    | Connection element                               | 5408022  | 2           |          |
| 11 | isCon HWS        | Information panel                                | 5408058  | 1           |          |





*The wind load describes how wind will affect the buildings and installations. It must be taken into account during planning.*

**Wind load**

For decades, wind load has been an important consideration for OBO Bettermann in relation to external lightning protection. Today’s calculation models and air-termination rod systems are the result of numerous studies and years of R&D experience.

The previous German standards in this area – DIN 1055:2005 Part 4: Wind loads and Part 5: Snow and ice loads, and DIN 4131: Steel antenna mounts – dealt with all load assumptions for mounts in Germany.

The eurocodes (EC) are the result of European standardisation in the construction field. EC 0 to EC 9 cover the documents in the series DIN EN 1990 to 1999. These are supplemented by the various national annexes (NA). The NAs contain provisions that go beyond the eurocode rules, i.e. the provisions that were previously part of the national standards.

Following the publication of the national annexes to the ECs, the old standards became invalid, following appropriate coexistence phases. (Table 2.8)

| Old standard                                | New standard   |
|---|--|
| DIN 1055:2005-03 Part 4: Wind loads         | Eurocode 1: DIN EN 1991-1-4:2010-12: Parts 1-4: General effects; wind loads + DIN EN 1991-1-4/NA: 2010-12                    |
| DIN 1055:2005-03 Part 5: Snow and ice loads | DIN EN 1991-1-3: 2010-12 -; Parts 1-3: General effects; snow loads + DIN EN 1991-1-3/NA: 2010-12                             |
| DIN V 4131:2008-09 Steel antenna mounts     | Eurocode 3: DIN EN 1993-3-1: 2010-12: Parts 3-1: Towers, masts and chimneys – Towers and masts + DIN EN 1993-3-1/NA: 2010-12 |

Table 1: Example: German national standards for the calculation of wind load



1st step: determining the wind zone

The second factor that needs to be known when determining the wind load is the wind load zone in which the object is located. (Table 2.9/Figure 2.21)

The standards contain no statements regarding the following aspects:

- Framework masts and towers with non-parallel main legs
- Guyed masts and chimneys
- Cable-stayed and suspension bridges
- Torsional vibrations

| Zone | Wind speed in m/s | Speed pressure in kN/m² |
|------|-------------------|-------------------------|
| 1    | 22.5              | 0.32                    |
| 2    | 25.0              | 0.39                    |
| 3    | 27.5              | 0.47                    |
| 4    | 30.0              | 0.56                    |

Table 2: Basic speeds and speed pressures



Figure 1: Wind zones in Germany according to DIN EN 1991-1-4 NA

2nd step: determining the terrain category (TC)

Terrain-specific loads and dynamic pressures are an important element in calculating wind loads. (Table 3)

| Terrain category (TC) | Definition  |
|-----------------------|---|
| Terrain category I    | Open sea; lakes with at least 5 km of open water in the wind direction; even, flat land without obstacles         |
| Terrain category II   | Terrain with hedges, individual farmsteads, buildings or trees, e.g. agricultural area                            |
| Terrain category III  | Suburbs, industrial or commercial areas; forests  |
| Terrain category IV   | Urban areas in which at least 15% of the area is built up with buildings whose average height is higher than 15 m |

Table 3: Terrain categories according to DIN EN 1991-1-4

### 3rd step: Determining the maximum gust speed

The tilt and slip resistance of air-termination rods must always be determined on a project-by-project basis. The reference height is the building height and two thirds of the length of the air-termination rod. The maximum gust speed at the project location must be determined.

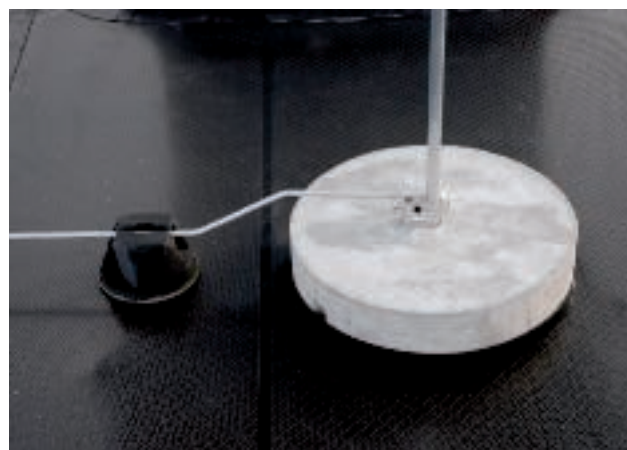


Figure 2: Air-termination rod with stand

Gust speed in wind zone I

| Reference height in metres | TC I in kph | TC II in kph | TC III in kph | TC IV in kph |
|----------------------------|-------------|--------------|---------------|--------------|
| 0                          | 112         | 105          | 100           | 93           |
| 5                          | 122         | 108          | 100           | 93           |
| 10                         | 136         | 124          | 103           | 93           |
| 16                         | 136         | 124          | 111           | 93           |
| 20                         | 139         | 128          | 115           | 98           |
| 30                         | 145         | 134          | 122           | 106          |
| 40                         | 149         | 139          | 128           | 112          |
| 70                         | 157         | 148          | 139           | 126          |
| 100                        | 162         | 155          | 147           | 135          |

Table 4: Gust speeds, wind zone I

Gust speed in wind zone II

| Reference height in metres | TC I in kph | TC II in kph | TC III in kph | TC IV in kph |
|----------------------------|-------------|--------------|---------------|--------------|
| 0                          | 124         | 117          | 111           | 104          |
| 5                          | 136         | 120          | 111           | 104          |
| 10                         | 145         | 131          | 114           | 104          |
| 16                         | 152         | 138          | 123           | 104          |
| 20                         | 155         | 142          | 127           | 109          |
| 30                         | 161         | 149          | 136           | 118          |
| 40                         | 165         | 154          | 142           | 125          |
| 70                         | 174         | 165          | 155           | 139          |
| 100                        | 180         | 172          | 163           | 150          |

Table 5: Gust speeds, wind zone II

Gust speed in wind zone III

| Reference height in metres | TC I in kph | TC II in kph | TC III in kph | TC IV in kph |
|----------------------------|-------------|--------------|---------------|--------------|
| 0                          | 137         | 129          | 122           | 114          |
| 5                          | 149         | 132          | 122           | 114          |
| 10                         | 159         | 144          | 126           | 114          |
| 16                         | 167         | 152          | 135           | 114          |
| 20                         | 170         | 156          | 140           | 119          |
| 30                         | 177         | 164          | 149           | 129          |
| 40                         | 182         | 170          | 156           | 137          |
| 70                         | 192         | 181          | 170           | 153          |
| 100                        | 198         | 189          | 180           | 165          |

Table 6: Gust speeds, wind zone III

Gust speed in wind zone IV

| Reference height in metres | TC I in kph | TC II in kph | TC III in kph | TC IV in kph |
|----------------------------|-------------|--------------|---------------|--------------|
| 0                          | 149         | 140          | 133           | 124          |
| 5                          | 163         | 144          | 133           | 124          |
| 10                         | 174         | 157          | 137           | 124          |
| 16                         | 182         | 166          | 148           | 125          |
| 20                         | 186         | 170          | 153           | 130          |
| 30                         | 193         | 179          | 163           | 141          |
| 40                         | 198         | 185          | 170           | 150          |
| 70                         | 209         | 198          | 185           | 167          |
| 100                        | 216         | 206          | 196           | 180          |

Table 7: Gust speeds, wind zone IV

#### 4th step: Determining what concrete blocks are required

Based on the maximum gust speed, the number and size (10 or 16 kg) of concrete blocks required can be determined for the air-termination rod used. The value in the tables must lie above the maximum gust speed for the location.

#### An example

The maximum gust speed at the location is 142 km/h.

A tapered pipe air-termination rod of type 101 VL2500 and height 2.5 m is used.

Because the value in Table 6 must be higher than the maximum gust speed at the location (i.e. in this case more than 142 km/h), the next possible value is 164. Three concrete blocks, each of weight 16 kg, must therefore be used.

#### Number of concrete blocks for tapered pipe air-termination rods

| Air-termination rod height in m | 1.5        | 2          | 2.5        | 3          | 3.5        | 4          | Concrete blocks required |
|---------------------------------|------------|------------|------------|------------|------------|------------|--------------------------|
| Type                            | 101 VL1500 | 101 VL2000 | 101 VL2500 | 101 VL3000 | 101 VL3500 | 101 VL4000 |                          |
| Item no.                        | 5401 98 0  | 5401 98 3  | 5401 98 6  | 5401 98 9  | 5401 99 3  | 5401 99 5  |                          |
| Wind speed kph                  | 117        | -          | -          | -          | -          | -          | 1 x 10 kg                |
|                                 | 164        | 120        | 95         | -          | -          | -          | 2 x 10 kg                |
|                                 | 165        | 122        | 96         | -          | -          | -          | 1 x 16 kg                |
|                                 | -          | 170        | 135        | 111        | 95         | -          | 2 x 16 kg                |
|                                 | -          | 208        | 164        | 136        | 116        | 102        | 3 x 16 kg                |

#### Number of concrete blocks for air-termination rod, one end rounded

| Air-termination rod height in m | 1            | 1.5          | 2            | 2.5          | 3            | Concrete blocks required |
|---------------------------------|--------------|--------------|--------------|--------------|--------------|--------------------------|
| Type                            | 101 ALU-1000 | 101 ALU-1500 | 101 ALU-2000 | 101 ALU-2500 | 101 ALU-3000 |                          |
| Item no.                        | 5401 77 1    | 5401 80 1    | 5401 83 6    | 5401 85 2    | 5401 87 9    |                          |
| Wind speed kph                  | 97           | -            | -            | -            | -            | 1 x 10 kg                |
|                                 | 196          | 133          | 103          | -            | -            | 1 x 16 kg                |
|                                 | -            | 186          | 143          | 117          | 100          | 2 x 16 kg                |
|                                 | -            | -            | 173          | 142          | 121          | 3 x 16 kg                |

#### Number of concrete blocks for air-termination rod, one end rounded with connection strap

| Air-termination rod height in m | 1           | 1.5         | Concrete blocks required |
|---------------------------------|-------------|-------------|--------------------------|
| Type                            | 101 A-L 100 | 101 A-L 150 |                          |
| Item no.                        | 5401 80 8   | 5401 85 9   |                          |
| Wind speed kph                  | 100         | -           | 1 x 10 kg                |
|                                 | 192         | 129         | 1 x 16 kg                |
|                                 | -           | 177         | 2 x 16 kg                |
|                                 | -           | 214         | 3 x 16 kg                |

Table 8: Number of OBO concrete blocks required



### Number of concrete blocks for insulated VA and Al air -termination rods

| Air-termination rod height in m                | 4         | 6         | 4         | 6         | Concrete blocks required |
|--|-----------|-----------|-----------|-----------|--------------------------|
| Material                                       | VA        | VA        | Al        | Al        |                          |
| Item no.                                       | 5408 94 2 | 5408 94 6 | 5408 94 3 | 5408 94 7 |                          |
| Item no. of appropriate interception rod stand | 5408 96 8 | 5408 96 9 | 5408 96 6 | 5408 96 7 |                          |
| Wind speed kph                                 | 120       | 94        | 120       | 92        | 3 x 16 kg                |
|  | 161       | 122       | 163       | 122       | 6 x 16 kg                |
|  | 194       | 145       | 197       | 147       | 9 x 16 kg                |
|  | 222       | 165       | 227       | 168       | 12 x 16 kg               |
|  | 246       | 182       | 252       | 187       | 15 x 16 kg               |

### Number of concrete blocks for insulated air-termination rods with exit

| Air-termination rod height in m                | 4         | 6         | 8         | 10        | Concrete blocks required |
|--|-----------|-----------|-----------|-----------|--------------------------|
| Item no.                                       | 5408 93 8 | 5408 94 0 | 5408 88 8 | 5408 89 0 |                          |
| Item no. of appropriate interception rod stand | 5408 93 0 | 5408 93 2 | 5408 90 2 | 5408 90 2 |                          |
| Wind speed kph                                 | 110       | 85        | 93        | 82        | 3 x 16 kg                |
|  | 148       | 111       | 116       | 102       | 6 x 16 kg                |
|  | 178       | 132       | 134       | 119       | 9 x 16 kg                |
|  | 204       | 151       | 151       | 133       | 12 x 16 kg               |
|  | 227       | 167       | 166       | 146       | 15 x 16 kg               |

Table 9: Number of OBO concrete blocks required for insulated air-termination rods

Number of concrete blocks for isFang air-termination rod with VA tripod

|   |           |           |           |           |           |           |           |           |           |                          |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------------------|
| Air-termination rod height m                | 4         | 4.5       | 5.0       | 5.5       | 6.0       | 6.5       | 7.0       | 7.5       | 8.0       | Required concrete blocks |
| Air-termination rod item no.                | 5402 86 4 | 5402 86 6 | 5402 86 8 | 5402 87 0 | 5402 87 2 | 5402 87 4 | 5402 87 6 | 5402 87 8 | 5402 88 0 |                          |
| Matching Air-termination rod stand Item no. | 5408 96 8 | 5408 96 8 | 5408 96 8 | 5408 96 8 | 5408 96 9 | 5408 96 9 | 5408 96 9 | 5408 96 9 | 5408 96 9 |                          |
| Wind speed km/h                             | 143       | 124       | 110       | 99        | 104       | 96        | 89        | 83        | 78        | 3 x 16 kg                |
|   | 193       | 168       | 148       | 133       | 138       | 127       | 117       | 109       | 102       | 6 x 16 kg                |
|   | 232       | 202       | 178       | 159       | 165       | 151       | 139       | 129       | 121       | 9 x 16 kg                |
|   | 266       | 231       | 203       | 182       | 188       | 172       | 159       | 147       | 138       | 12 x 16 kg               |
|   | 296       | 257       | 226       | 202       | 208       | 191       | 176       | 163       | 152       | 15 x 16 kg               |

Table 10: Number of OBO concrete blocks required for the isFang air-termination rod

Number of concrete blocks for isFang rod with AI tripod

|  |           |           |           |           |           |           |           |           |           |                          |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------------------|
| Air-termination rod height in m                | 4         | 4,5       | 5,0       | 5,5       | 6,0       | 6,5       | 7,0       | 7,5       | 8,0       | Concrete blocks required |
| Air-termination rod item no.                   | 5402 86 4 | 5402 86 6 | 5402 86 8 | 5402 87 0 | 5402 87 2 | 5402 87 4 | 5402 87 6 | 5402 87 8 | 5402 88 0 |                          |
| Appropriate Air-termination rod stand Item no. | 5408 96 6 | 5408 96 6 | 5408 96 6 | 5408 96 6 | 5408 96 7 | 5408 96 7 | 5408 96 7 | 5408 96 7 | 5408 96 7 |                          |
| Wind speed km/h                                | 140       | 122       | 108       | 97        | 101       | 93        | 86        | 80        | 76        | 3 x 16 kg                |
|  | 191       | 166       | 146       | 131       | 136       | 124       | 115       | 107       | 100       | 6 x 16 kg                |
|  | 230       | 200       | 176       | 158       | 163       | 149       | 138       | 128       | 120       | 9 x 16 kg                |
|  | 264       | 229       | 202       | 181       | 186       | 170       | 157       | 146       | 136       | 12 x 16 kg               |
|  | 295       | 255       | 225       | 201       | 206       | 189       | 174       | 162       | 151       | 15 x 16 kg               |

Table 11: Number of OBO concrete blocks required for the isFang air-termination rod



## Laboratory testing of lightning and surge protection components

In the BET testing centre, lightning and surge protection components, lightning protection structures and surge protection devices are put through their paces by highly qualified specialists in accordance with the relevant standards. In addition, the impact of events involving lightning is scientifically investigated.

The BET possesses a test generator for lightning current tests of up to 200 kA and a hybrid generator for surge current tests of up to 20 kV. Tasks performed include developmental tests of new developments and modifications to OBO surge protection devices according to the testing standard IEC 61643-11 (VDE 0675-6-11). The tests for lightning protection components are carried out according to IEC 62561-1 (DIN EN 62561-1) and those for spark gaps according to IEC 62561-3 (DIN EN 62561-3).

The hybrid generator is used for testing data cable protection devices in accordance with IEC 61643-21 (VDE 0845-3-1) "Surge protective devices connected to telecommunications and signalling networks".

The following standard-compliant tests can be carried out:

- Lightning protection components to EN 62561-1
- Spark gaps to EN 62561-3
- Lightning current meters to EN 62561-6
- Surge protection devices to EN 61643-11
- Data cable protection devices to EN 61643-21
- Environmental testing to EN ISO 9227 (neutral continuous salt spray testing)
- Environmental testing to EN 60068-2-52 (cyclical salt spray testing)
- Environmental testing to EN ISO 6988 (SO<sub>2</sub> toxic gas testing)
- IP protection rating to EN 60592
- Tensile strength to EN 10002-1

However, customer-specific requirements and tests not covered by standards can be tested up to the following parameters:

- Lightning current pulses (10/350) up to 200 kA, 100 As and 10 MA<sup>2</sup>s
- Surge current pulses (8/20) up to 200 kA
- Combined surges (1.2/50) up to 20 kV
- Combined surges (10/700) up to 10 kV
- Follow current system 255 V, 50 Hz, up to 3 kA
- Insulation measurement up to 5 kV AC, 50 Hz and up to 6 kV DC
- Conductivity measurements up to 63 A, 50 Hz
- Tensile and compression strengths up to 100 kN



Figure 3: BET test generator



Figure 4: BET SO<sub>2</sub> testing system



## Lightning protection guide. Safely routed.

### Reference work and planning aid for electrical installation engineers and technical planners

At OBO Bettermann, we can look back on more than 90 years of experience in the field of lightning and surge protection. This experience and, of course, the latest standards and technical innovations have flowed into the company's new lightning protection guide. The brochure allows you to plan installations in the field of lightning and surge protection faster and more easily.

It contains a balanced mixture of basic knowledge and expert knowledge, as well as planning and selection aids for the protection of buildings and systems.

The new lightning protection guide can be requested by calling +49 (0)2373 89-1500 and is also available for download.

### Topics

- Basic principles
- The external lightning protection system
- Air-termination and conductor systems
- Examples and selection aids for wind load calculation conform with Eurocode 1+3
- Earthing systems with foundation earthing to current DIN 18014
- The internal lightning protection system
- Equipotential bonding systems
- Overvoltage protection systems
- Current standards
- New selection and planning aids
- Examples





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