



# OBO-Typicals

Montagedetailzeichnungen

von Blitzschutz-, Erdungs- und  
Potentialausgleichssystemen

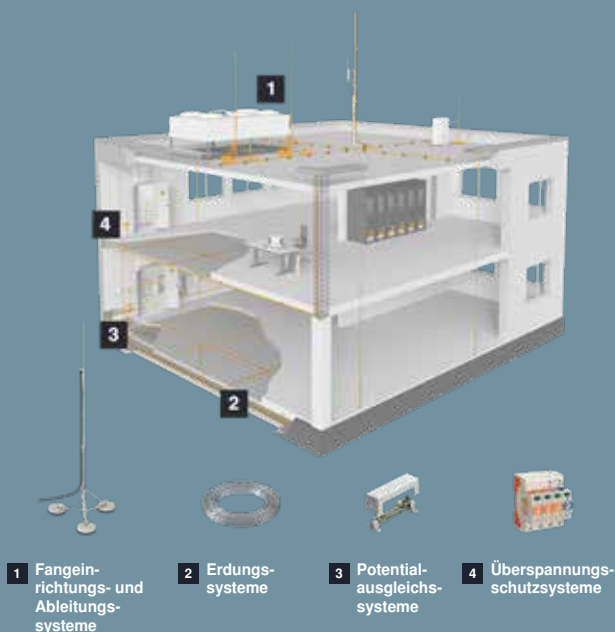
# Basiswissen

## Grundlagen zur normgerechten Planung

Ihre Planungshilfe für die praktische Umsetzung der aktuellen Normen und Vorschriften.

### Mit innovativer OBO-Technik gegen:

- Gefährdung durch Blitzstrom und induzierte Spannungen
- Schäden durch Feuer, Explosion, Schrittspannung, Berührungsspannung, etc.
- Schäden an Personen, Gebäuden und Gebäudeinhalten



## Beschützt

Das Prinzip „Beschützt hoch vier“:  
Nur ein abgestimmter Schutz ist echter Schutz.  
Lernen Sie die Aufgaben der einzelnen Systeme im Video kennen.



## OBO ACADEMY

Connect to knowledge

Von den Grundlagen bis zur konkreten Anwendung – in lokalen Schulungsangeboten vermitteln wir Wissen zu:

- Normativen Grundlagen
- Risikoanalysen, Blitzschutzklassen, Blitzschutzsystemen
- Erderanforderungen bei Tiefenerdern, Ringerdern und Fundamenterdern
- Gefahren von Blitzentladungen und Überspannungen
- Blitzschutzzonen und Ableitertechnologien
- Schutzpotentialausgleich und Funktionspotentialausgleich
- Anwendungsbeispielen, Installationshinweisen, Planungshilfen, Praxisfragen

# Erdungssysteme

## Das Fundament für Blitz- und Überspannungsschutz

### Erderanforderungen nach ÖVE/ÖNORM EN 62305-3

#### Typ A

- Horizontalerder
- Vertikalerder (Tiefenerder)

#### Typ B

- Ringerder (Obeflächenerder)
- Fundamenterder

### Erderanordnung Typ A (Horizontal- und Tiefenerder)

Für die Anordnung Typ A ist die Mindestanzahl zwei Erder.

Als Mindestlänge für Erder Typ A gilt, zum Beispiel für die Blitzschutzklasse III eine Länge von 2,5 m bei vertikaler Verlegung und 5 m bei horizontaler Verlegung.

#### Horizontalerder

in Form von Strahlen-, Ring- und Maschenerdern. Als Material wird Rund- oder Bandmaterial verwendet, das im Allgemeinen in einer Tiefe von 0,5 m bis 1,0 m (je nach örtlicher Frosttiefe) eingebracht wird.

#### Tiefenerder

aus Rund- oder Profilstahl, die im Allgemeinen senkrecht in größere Tiefen eingebracht werden.

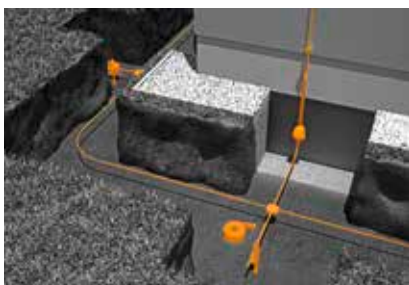
Sie unterliegen aber, je nach Erdreich, einer mehr oder weniger starken Korrosion. Deshalb ist zu beachten, ob es sich um einen Teil der Fundamenterdung (V4A) oder um eine reine Blitzschutzterdung (nicht zwingend V4A erforderlich) handelt.

### Erderanordnung Typ B (Fundamenterder, Ringerder)

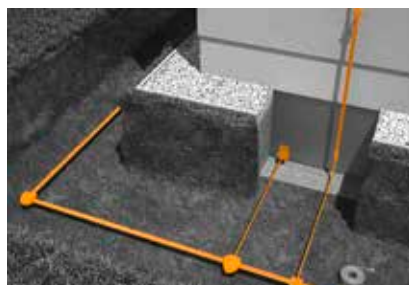
Damit der Fundamenterder gegen Korrosion geschützt ist, muss er von mindestens 5 cm Beton allseitig umschlossen sein. Dadurch hat er eine nahezu unbegrenzte Lebensdauer. Als Werkstoff für den Fundamenterder ist Stahl zu verwenden. Der Stahl kann sowohl verzinkt als auch unverzinkt ausgeführt sein.

Wenn der Erder im Gebäudefundament nicht eingebracht werden kann oder aus dem Fundament herausgeführt wird, muss Rund- oder Bandmaterial aus korrosionsfestem Edelstahl (V4A) verwendet werden.

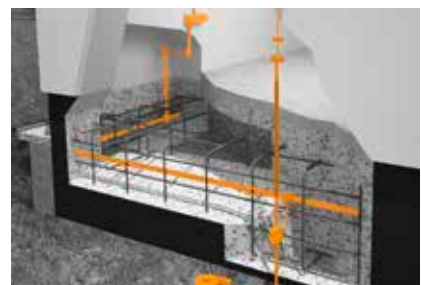
Rundstahl muss einen Durchmesser von mindestens 10 mm haben. Bei Bandstahl müssen die Abmessungen mindestens 30 x 3 mm betragen.



Typ A – Tiefenerder mit Potentialausgleich

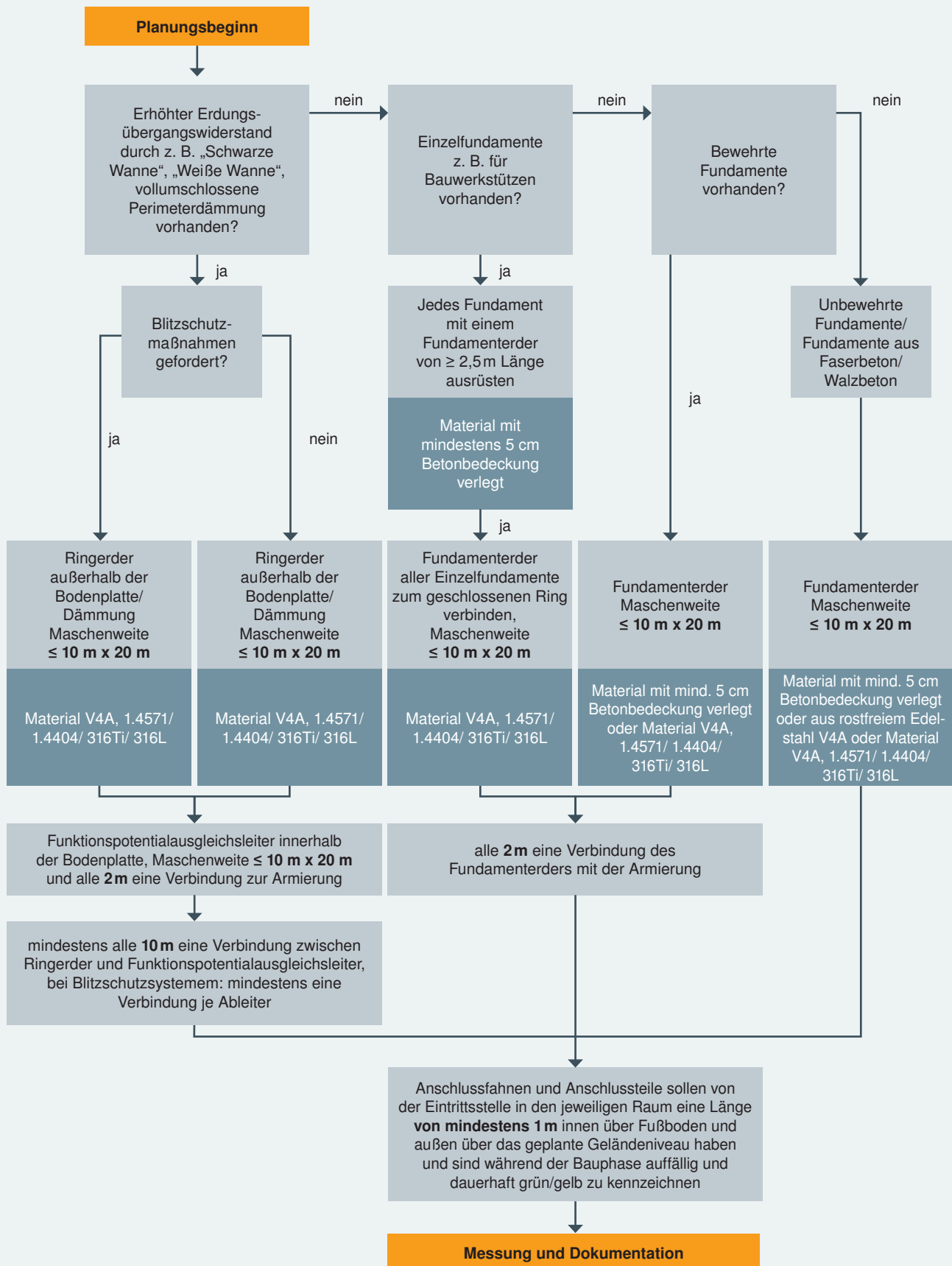


Typ B – Ringerder



Typ B – Fundamenterder

# Planungshilfe zur Ausführung eines Fundamenterders



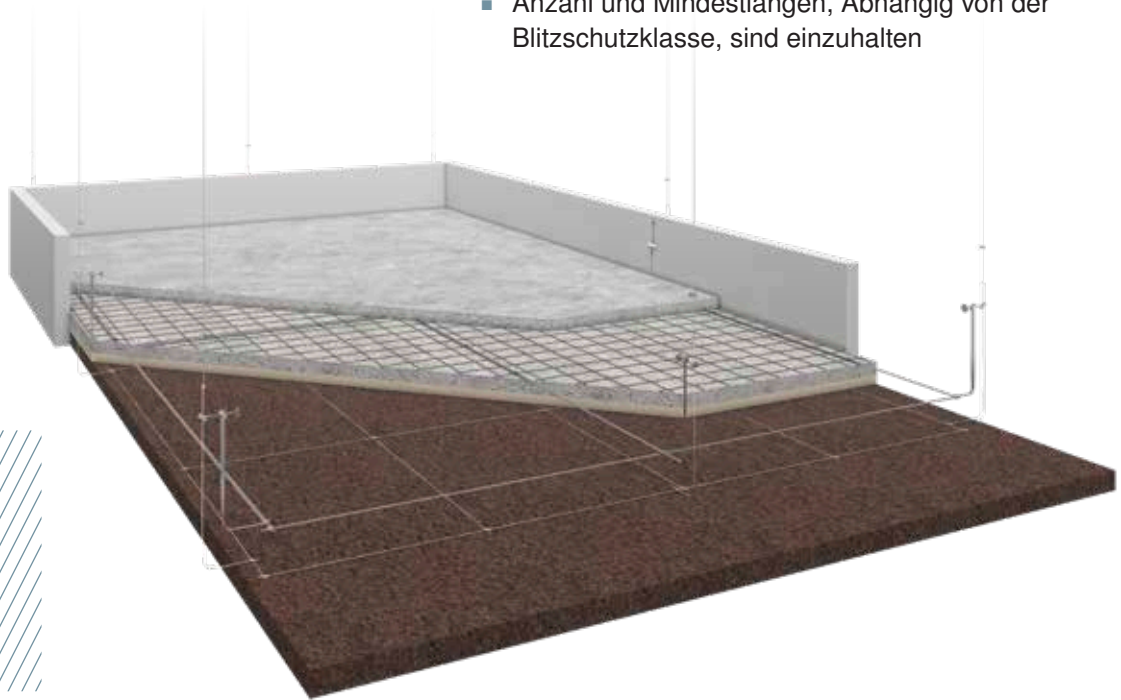


### Erdungsmaterial für die Verwendung im Beton:

- Mindestens allseitig mit 5 cm Beton umschlossen
- ≤ 2 m mit Bewehrung verbinden
- Maschenweite max. 10 x 20 m

### Erdungsmaterial für die Verwendung im Erdreich:

- Material V4A
- Klemmen im Erdreich mit Korrosionsschutzbinde
- Verlegetiefe 0,5 - 1,0 m (je nach örtlicher Frosttiefe)
- Verlegung außerhalb der Drainageschicht (Verlegung im feuchten Bereich)
- Anzahl und Mindestlängen, Abhängig von der Blitzschutzklasse, sind einzuhalten



	Typ	VPE	Art.-Nr.	Beschreibung
	RD 10 FT	80 m	5021 103	Runddraht Ø 10 mm FT, 50 kg/Ring (0,63 kg/m)
	5052 DIN 30X3.5	60 m	5019347	Flachleiter 30x3.5 FT, 50 kg/Ring (0,84 kg/m)
	5052 DIN 40X4	40 m	5019355	Flachleiter 40x4 FT, 50 kg/Ring (1,28 kg/m)
	1811	25 Stk.	5014018	Abstandhalter FT Länge 250 mm
	1814 FT	25 Stk.	5014468	Anschlussklemme an Bewehrung Ø 8-14 mm
	1814 FT D37	25 Stk.	5014469	Anschlussklemme an Bewehrung Ø 16-37 mm
	205 DG L180 A4	10 Stk.	5420022	Erdungsfestpunkt M10/M12 V4A
	205 DG L180 FT	10 Stk.	5420024	Erdungsfestpunkt M10/M12 FT
	DW RD10	10 Stk.	2360041	Dichtmanschette für Rundleiter 10 mm
	252 8-10 FT	25 Stk.	5312310	Kreuzverbinder mit Zwischenplatte
	RD 10-V4A	50 m	5021642	Runddraht Ø 10 mm V4A, 32 kg/Ring (0,63 kg/m)
	5052 V4A 30X3.5	25 m	5018730	Flachleiter 30x3.5 V4A, 21 kg/Ring (0,83 kg/m)
	250 V4A	10 Stk.	5312925	Kreuzverbinder für Flach- und Rundleiter V4A
	252 8-10 V4A	10 Stk.	5312318	Kreuzverbinder mit Zwischenplatte V4A
	249 8-10 V4A	10 Stk.	5311404	Schnellverbinder Vario rund/rund, V4A
	219 20 BP V4A	5 Stk.	5000866	Tiefenerder BP, Ø 20 mm, Länge: 1,5 m, V4A
	1819 20BP	5 Stk.	3041212	Erderspitze für Tiefenerder ST und BP
	2760 20 V4A	5 Stk.	5001633	Anschlussschelle für Tiefenerder, universell, V4A
	356 50	1 Stk.	2360055	Korrosionsschutzbinde, Breite: 50 mm
	ProtectionBall	25 Stk.	5018014	Schutzkappe für Anschlussfahnen

### Besondere Anforderungen bei Fundamenten mit Wannendichtungen und Perimeterdämmung

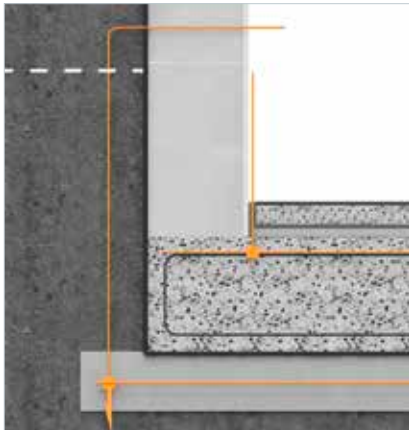
Bei Wannendichtungen ist die Erdfähigkeit des Erders nicht gewährleistet. Deshalb ist ein Ringerder außerhalb der Wannendichtung einzubringen. Ein dauerhafter Korrosionsschutz ist zu beachten. Die Verwendung von nicht rostenden Edelstählen (V4A) ist notwendig.

### Schwarze Wanne

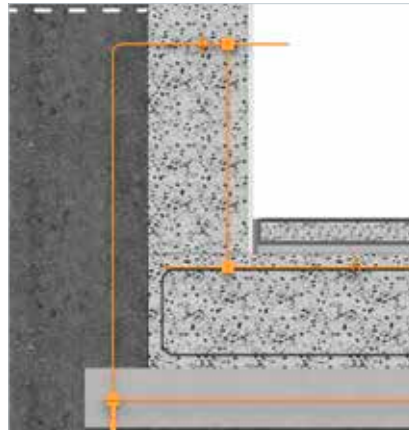
Es handelt sich hierbei um wasserdruckhaltende Abdichtungen des Gebäudes aus unterschiedlichen, mehrlagigen Kunststoff- bzw. Bitumenbahnen (schwarzes Material).

### Weißer Wanne

Die weiße Wanne wird aus wasserundurchlässigem Beton (WU-Beton) hergestellt. Der Beton kann zwar Wasser aufnehmen, allerdings wird trotz langzeitigem Einwirken des Wassers auf den Beton nicht die gesamte Dicke durchdrungen, d. h., auf der Wandinnenseite tritt keine Feuchtigkeit auf.



Schwarze Wanne,  
Ringerdereinführung oberhalb des  
höchsten Grundwasserstandes



Weißer Wanne, druckwasserdichte  
Ringerdereinführung im Grundwasser



Isolierte Bodenplatte mit Perimeter-  
dämmung (hier: blau markiert)

# Potentialausgleich

## Schutz vor gefährlichen Potentialunterschieden







**Der Schutzpotentialausgleich ist herzustellen, indem an die Haupterdungsschiene folgende Leiter, falls zutreffend, angeschlossen werden:**

- Erdungsleiter zum Anlagenerder;
- Schutzleiter der Hauptleitung (PE- oder PEN-Leiter);
- Schutzpotentialausgleichsleiter von Antennenanlagen;
- Funktions- und Überspannungserdungsleiter der Informationstechnik;
- Schutzpotentialausgleichsleiter vom Blitzschutzsystem (LPS);
- Potentialausgleichsleiter von leitfähigen Wasserverbrauchsleitungen;
- Schutzpotentialausgleichsleiter von leitfähigen Gasinnenleitungen;
- Schutzpotentialausgleichsleiter von anderen im Gebäude geführten metallenen Rohrsystemen, z. B. zentraler Heizungs- und Klimaanlage, Abgasfänge;



- Schutzpotentialausgleichsleiter von weiteren fremden leitfähigen Teilen sofern im üblichen Gebrauchszustand berührbar;
- Schutzpotentialausgleichsleiter von leitfähigen Bewehrungen von Konstruktionen aus Beton, wo diese berührbar und zuverlässig untereinander verbunden sind

## Produkte für den Potentialausgleich

Typ	VPE	Art.-Nr.	Beschreibung
 1801 VDE	1 Stk.	5015650	Potentialausgleichsschiene für den Innenbereich mit Klemmschiene - auch für Industrie und Ex-Bereich geeignet. 7x2,5-25 mm <sup>2</sup> ; 2x25-95 mm <sup>2</sup> ; 1 x FL 30 x 3,5 mm
 1809	1 Stk.	5015073	Potentialausgleichsschiene für den Innenbereich für Privatanwendungen. 7x bis 25 mm <sup>2</sup> ; 1 x Rd 8-10; 1 x FL 30 oder Rd 8-10
 1809 BG	1 Stk.	5015502	Potentialausgleichsschiene für Kleinanlagen 3x bis 6 mm <sup>2</sup> ; 2 x bis 16 mm <sup>2</sup>
 1809 A	1 Stk.	5015111	Potentialausgleichsschiene für den Außenbereich UV-beständig, Schrauben und Überleger aus VA. 7 x bis 25 mm <sup>2</sup> ; 1 x Rd 8-10; 1 x FL 30 oder Rd 8-10
 1802 10 VA	1 Stk.	5015866	Potentialausgleichsschiene BigBar für den Industriebereich (ebenfalls Ex-Bereich geeignet) aus Edelstahl V2A, mit Isolatorfüßen 10 Anschlüsse mit M10 Schlossschrauben
 927 1	10 Stk.	5057 51 5	Bänderungsschelle Edelstahl



# Blitzschutzsysteme

Blitzschutz ist vorbeugender Brandschutz

## Aktuell gültige Norm: ÖVE/ÖNORM EN 62305

- Teil 1: Allgemeine Grundsätze
- Teil 2: Risiko-Management
- Teil 3: Schutz von baulichen Anlagen und Personen
- Teil 4: Elektrische und elektronische Systeme in baulichen Anlagen

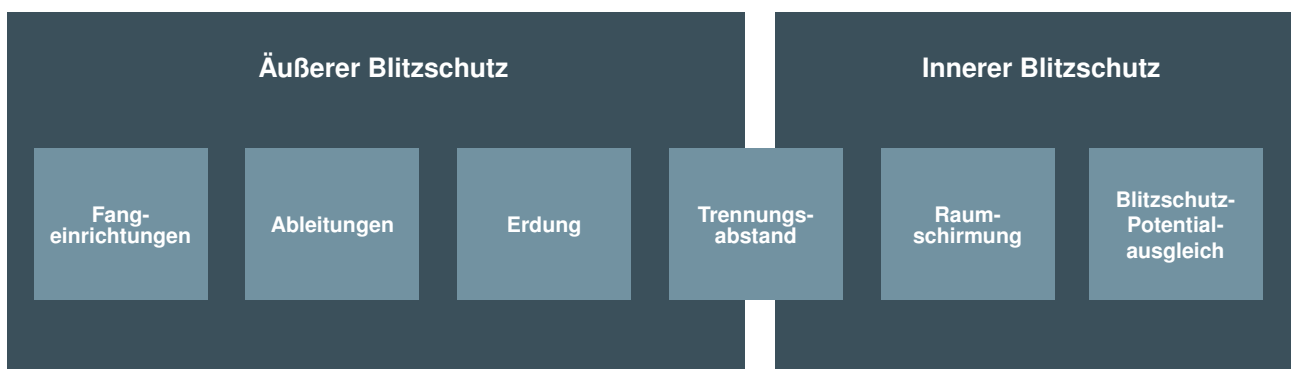


Einer der wesentlichen Bewertungsfaktoren bei jeder Risikoanalyse im Blitzschutz ist die lokale Dichte der Erdblitze. Diese wird in Erdblitze je km<sup>2</sup>/Jahr ausgedrückt und sollte durch Messungen mit

einem Blitzortungsverfahren bestimmt werden. Das Ergebnis dieser Risikoanalyse ist der vorhandene Gefährdungspegel I - IV. Der Planer muss die dazu passende Blitzschutzklasse I - IV realisieren.

## Systeme des äußeren und inneren Blitzschutzes

Nur koordiniert eingesetzte Maßnahmen können einen umfassenden Blitzschutz bieten.





### Schutzklasse des Blitzschutzsystems

Die Kennwerte eines Blitzschutzsystems (LPS = lightning protection system) werden durch die Kennwerte der zu schützenden baulichen Anlage und unter Beachtung der Blitzschutzklasse festgelegt.

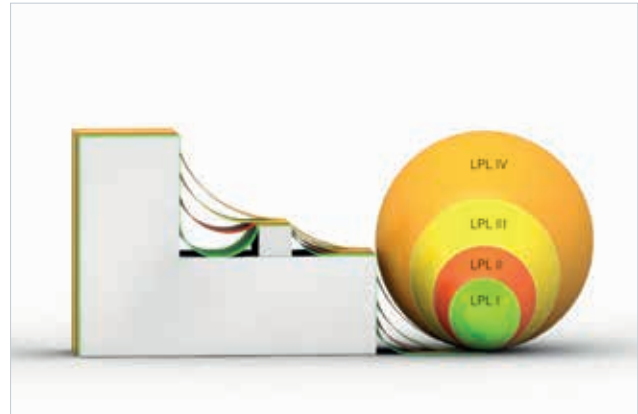
**Jede Schutzklasse eines LPS ist gekennzeichnet durch:**

#### a) Kenndaten, die von der Schutzklasse des LPS abhängig sind:

- Blitzkennwerte
- Blitzkugelradius, Maschenweite und Schutzwinkel
- Typische Abstände zwischen Ableitungen und Ringleitern
- Trennungsabstand zur Vermeidung gefährlicher Funkenbildung
- Mindestlänge der Erder

#### b) Kenndaten, die von der Schutzklasse des LPS unabhängig sind:

- Blitzschutz-Potentialausgleich
- Mindestdicke von Metallblechen oder Metallrohren in Fangeinrichtungen
- Werkstoff, Form und Mindestmaße von Fangeinrichtungen, Ableitungen und Erdern



Norm	...sterreichisches Beiblatt	Inhalt
ÖVE ÖNORM EN 62305 Teil 1		Blitzschutz – Teil 1: Allgemeine Grundsätze
ÖVE ÖNORM EN 62305 Teil 2		Blitzschutz – Teil 2: Risiko-Management
ÖVE ÖNORM EN 62305 Teil 3		Blitzschutz – Teil 3: Schutz von baulichen Anlagen und Personen
	1	Zusätzliche Informationen zur Anwendung der EN 62305-3
	2	Zusätzliche Informationen für bauliche Anlagen mit explosionsgefährdeten Bereichen
	3	Auswahl der Mindest-Blitzschutzklasse und der Prüfindervalle für bauliche Anlagen
		Verwendung von Metalldächern in Blitzschutzsystemen
		Blitz- und Überspannungsschutz in PV-Stromversorgungssystemen
ÖVE ÖNORM EN 62305 Teil 4		Blitzschutz – Teil 4: Elektrische und elektronische Systeme in baulichen Anlagen
ÖVE ÖNORM EN 50539-11		Überspannungsschutzgeräte für Niederspannung
OVE E 8101		Errichtung von elektrischen Anlagen mit Nennspannungen bis AC 1000V und DC 1500V
OVE E 8101-7-712		Errichtung von elektrischen Anlagen mit Nennspannungen bis AC 1000V und DC 1500V
OVE Richtlinie R 6-2-1		Blitz- und Überspannungsschutz Teil 2-1: Photovoltaikanlagen - Blitz- und Überspannungsschutz
OVE Richtlinie R 6-2-2		Blitz- und Überspannungsschutz Teil 2-2: Photovoltaikanlagen - Auswahl und Anwendungsgrundsätze an Überspannungsschutzgeräten

Wichtige Blitzschutznormen und Vorschriften



Produktnormen	Inhalt
ÖVE ÖNORM EN 62561-1	Blitzschutzbauteile – Anforderungen für Verbindungsbauteile
ÖVE ÖNORM EN 62561-2	Blitzschutzbauteile – Anforderungen an Leiter und Erder
ÖVE ÖNORM EN 62561-3	Blitzschutzbauteile – Anforderungen an Trennfunkstrecken
ÖVE ÖNORM EN 62561-4	Blitzschutzbauteile – Anforderungen an Halter
ÖVE ÖNORM EN 62561-5	Blitzschutzbauteile – Anforderungen für Revisionskästen und Erderdurchführungen
ÖVE ÖNORM EN 62561-6	Blitzschutzbauteile – Anforderungen an Blitzzähler
ÖVE ÖNORM EN 62561-7	Blitzschutzbauteile – Anforderungen an Mittel zur Verbesserung der Erdung
IEC TS 62561-8	Blitzschutzbauteile - Anforderungen an Komponenten für isolierte Blitzschutzsysteme
VDE 0675-6-11 (IEC 61643-11)	Überspannungsschutzgeräte für den Einsatz in Niederspannungsanlagen – Anforderungen und Prüfungen
VDE 0845-3-1 (IEC 61643-21)	Überspannungsschutz für den Einsatz in Telekommunikations- und signalverarbeitenden Netzwerken

### Blitzschutz- und Überspannungsschutz-Komponenten

### Produktnormen für Blitz- und Überspannungsschutzkomponenten



## Fangeinrichtungen

### Planung mit dem Schutzwinkel-, Blitzkugel- und Maschenverfahren

Die Wahrscheinlichkeit, dass ein Blitzstrom in eine zu schützende bauliche Anlage eindringt, wird durch eine richtig geplante Fangeinrichtung wesentlich verringert.

**Die Fangeinrichtung kann aus einer beliebigen Kombination folgender Bestandteile zusammengesetzt sein:**

- Fangstangen (einschließlich freistehender Masten)
- gespannte Seile
- vermaschte Leiter

Die einzelnen Fangstangen sollten auf Dachhöhe miteinander verbunden werden, um eine Stromaufteilung sicherzustellen.

Fangeinrichtungen müssen an einer baulichen Anlage an Ecken, freiliegenden Stellen und Kanten (vor allem am oberen Teil der Fassaden) angebracht werden.

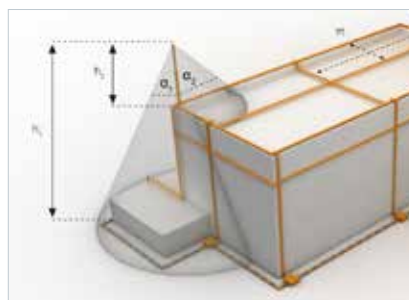
Abhängig von der praktischen Bewertung der baulichen Anlage wird eine oder eine Kombination der folgenden Planungsmethoden gewählt.

- Blitzkugelverfahren
- Schutzwinkelverfahren
- Maschenverfahren

### Planungsmethoden für Fangeinrichtungen



Das Blitzkugelverfahren ist in allen Fällen, aber besonders für komplexe Anlagen, geeignet.



Das Schutzwinkelverfahren ist für Gebäude mit einfacher Form geeignet.



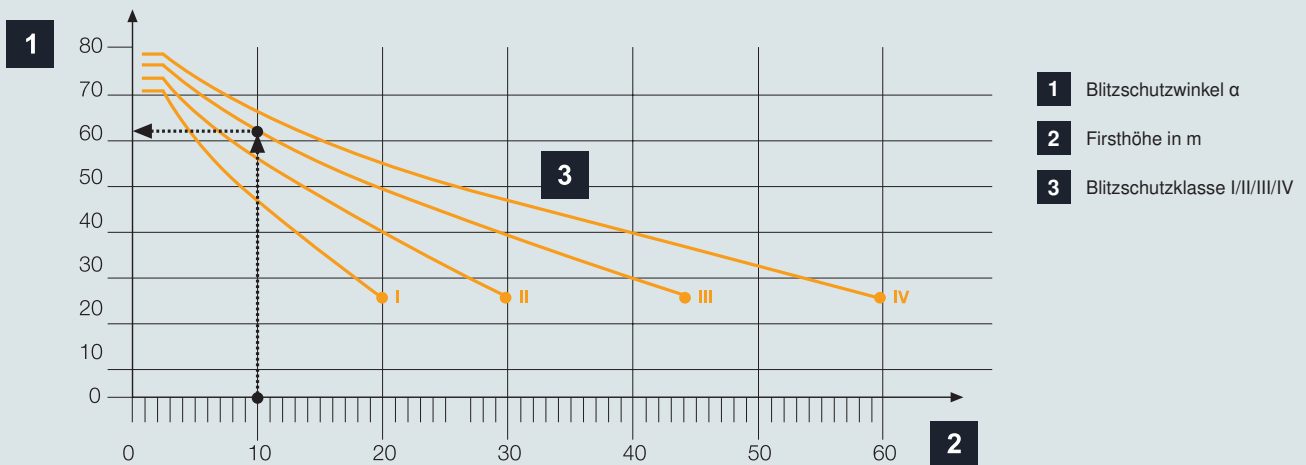
Das Maschenverfahren ist für Gebäude mit einfacher Form, z. B. mit Flachdächern geeignet.

Basis für die Berechnung der Fangeinrichtung sind bei den unterschiedlichen Schutzverfahren der Blitzkugelradius, die Maschenweite oder der Schutzwinkel  $\alpha$ . Den Tabellen sowie dem

Hilfsdiagramm können Basisdaten für die jeweilige Blitzschutzklasse entnommen werden und als Orientierung für die folgenden Schutzverfahren dienen.

Schutzverfahren			
Blitzschutzklasse	Radius der Blitzkugel r	Maschenweite W	Schutzwinkel $\alpha^\circ$
I	20m	5 x 5m	siehe Grafik unterhalb Die BSK IV wird in Österreich nicht angewendet!
II	30m	10 x 10m	
III	45m	15 x 15m	
IV	60m	20 x 20m	

Höchstwerte des Blitzkugelradius, der Maschenweite und des Schutzwinkels nach der entsprechenden Blitzschutzklasse des LPS nach ÖVE/ÖNORM EN 62305-3



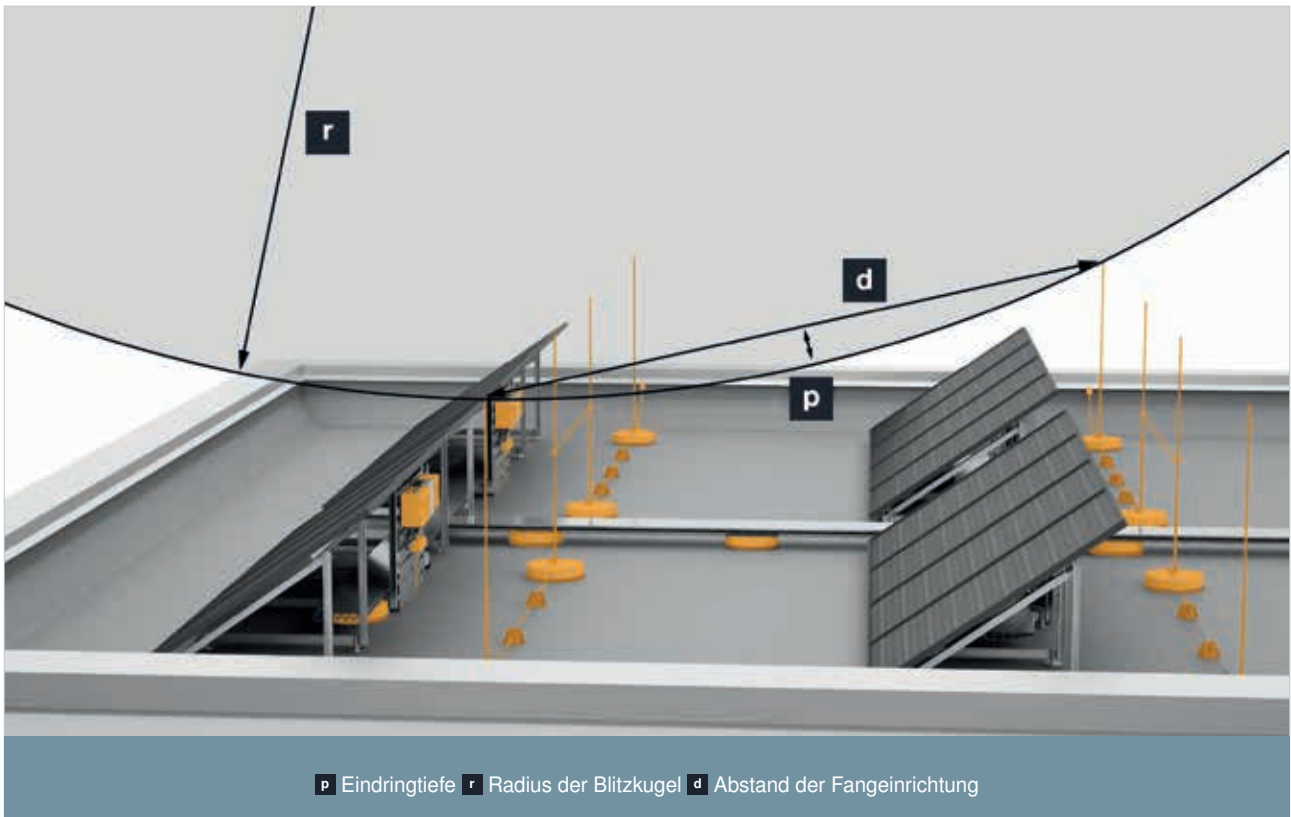
Hilfsdiagramm zur Schutzwinkelbestimmung nach ÖVE/ÖNORM EN 62305-3

Blitzschutzklasse	Schutzwinkel $\alpha^\circ$ für Fangstangen bis 2m Länge
I	70°
II	72°
III	76°

Schutzwinkel nach Blitzschutzklasse nach ÖVE/ÖNORM EN 62305-3 für Fangstangen bis zu 2 m

# Blitzkugelverfahren

## Kalkulation der Eindringtiefe



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

Formel zur Berechnung der Eindringtiefe (p)

### Dachaufbauten mit mehreren Fangstangen absichern

Wenn Sie mehrere Fangstangen verwenden, um ein Objekt abzusichern, müssen Sie die Eindringtiefe zwischen den Fangstangen berücksichtigen. Verwenden Sie zur genauen Berechnung die nebenstehende Formel. Einen schnellen Überblick erhalten Sie mit der unten gezeigten Tabelle.

### Eindringtiefe nach der Blitzschutzklasse

Abstand der Fangeinrichtung (d) in m	Eindringtiefe in m Blitzschutzklasse I Blitzkugel: R=20 m	Eindringtiefe in m Blitzschutzklasse II Blitzkugel: R=30 m	Eindringtiefe in m Blitzschutzklasse III Blitzkugel: R=45 m	Eindringtiefe in m Blitzschutzklasse IV Blitzkugel: 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

# Schutzwinkelverfahren

## Installationsprinzip Gebäude mit Spitzdach

### 1. Schritt: Ermittlung der Gebäudehöhe

Ermitteln Sie die Firsthöhe des Gebäudes. Diese Höhe ist der Ausgangspunkt für die Planung der gesamten Blitzschutzanlage. Auf dem First wird die Firstleitung verlegt und bildet so das „Rückgrat“ der Fangeinrichtung.

### 2. Schritt: Bestimmung des Schutzwinkels $\alpha$

Übertragen Sie die Höhe des Gebäudes in das Diagramm, um den Schutzwinkel abzulesen. Den Schutzwinkel übertragen Sie auf das Gebäude.

### 3. Schritt: Gebäudeteile außerhalb des Schutzwinkels

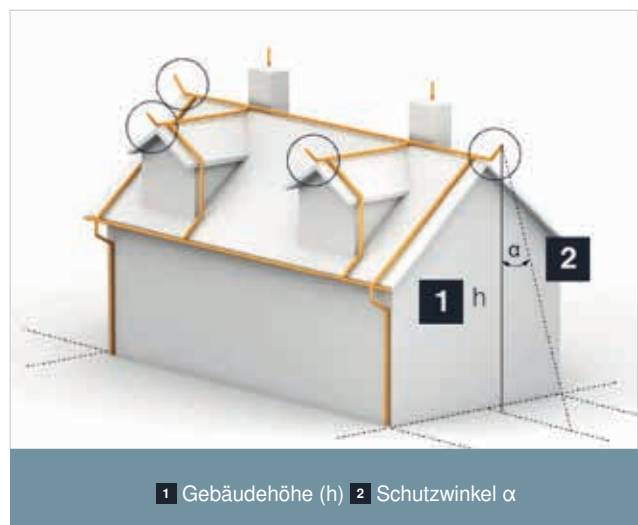
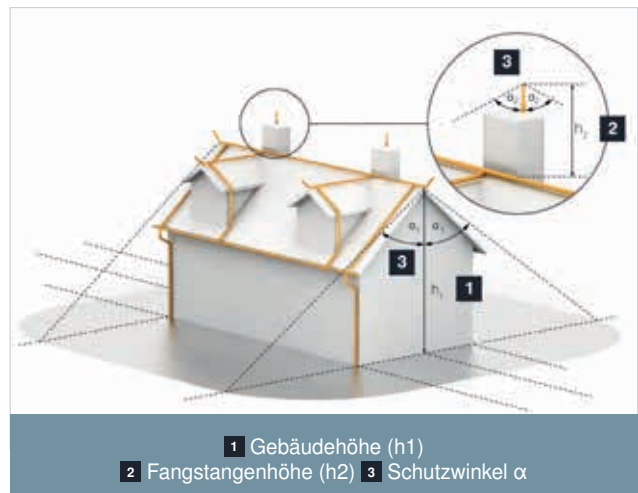
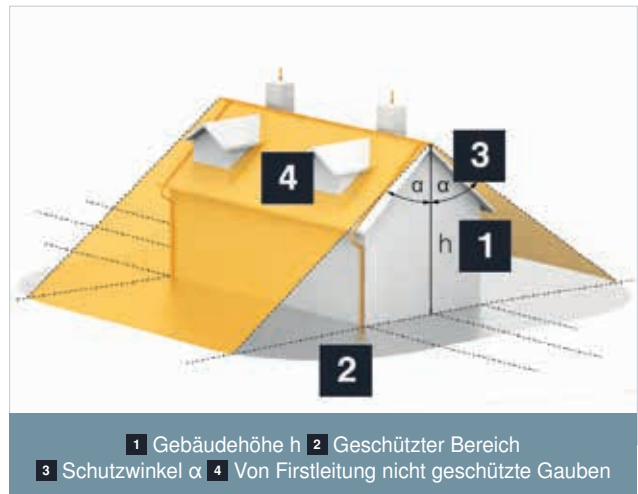
Gebäudeteile, die außerhalb des geschützten Bereichs liegen, müssen zusätzlich geschützt werden. Der Schornstein in unserem Beispiel hat einen Durchmesser von 70 cm und benötigt somit eine 1,5 m lange Fangstange. Die Dachgauben erhalten eine eigene Firstleitung.

### 4. Schritt: Vervollständigung der Fangeinrichtung

Verbinden Sie die Fangeinrichtung mit den Ableitungen. Die Enden der Firstleitung sollten überstehen und um 0,15 m nach oben gebogen werden. So sind eventuell herausragende Vordächer ebenfalls geschützt.

### Folgende Dachaufbauten sind mit Fangeinrichtungen gegen direkte Blitzeinschläge zu schützen:

- metallische Materialien mit mehr als 0,3m Höhe
- nichtleitende Materialien (z. B. PVC-Rohre) mit mehr als 0,5m Höhe



# Maschenverfahren

Installationsprinzip Gebäude mit Flachdach

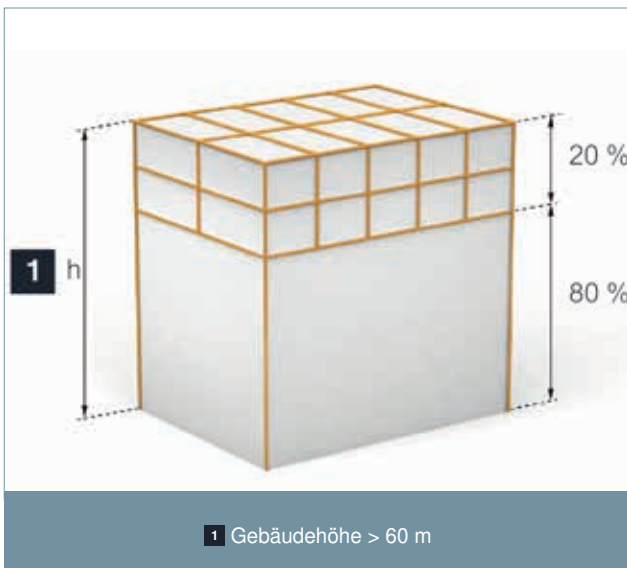


## 1. Schritt: Verlegung der Fangeinrichtung

Zunächst wird ein Rundleiter an allen bevorzugten Einschlagstellen wie Firsten, Graten oder Kanten verlegt. Den geschützten Bereich ermitteln Sie, indem Sie die Höhe des Gebäudes in das Diagramm übertragen, den Schutzwinkel ablesen und diesen auf das Gebäude übertragen.

## 2. Schritt: Verlegung der Maschen

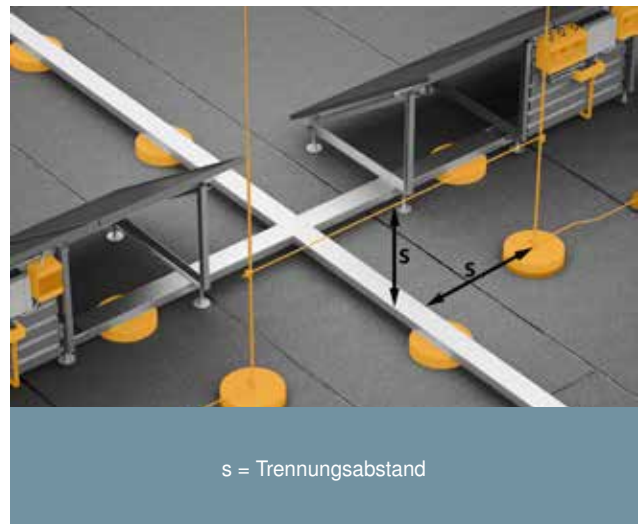
Je nach Blitzschutzklasse des Gebäudes gelten unterschiedliche Maschenweiten. Ist die Gesamtlänge l wie in unserem Beispiel größer als 20 m, muss zusätzlich ein Dehnungsstück für temperaturbedingte Längenänderungen eingefügt werden.



## 3. Schritt: Schutz gegen seitlichen Einschlag

Ab einer Gebäudehöhe von 60 m und dem Risiko von hohen Schäden (z. B. bei elektrischen oder elektronischen Einrichtungen) empfiehlt sich die Errichtung einer Ringleitung gegen seitlichen Einschlag.





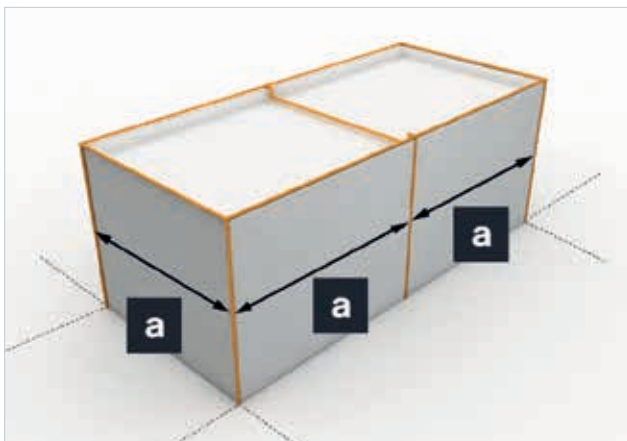
#### 4. Schritt: Schutz der Dachaufbauten

Zusätzlich müssen noch alle Dachaufbauten durch Fangstangen abgesichert werden. Hierzu ist es notwendig, auf die Einhaltung des Trennungsabstandes (s) zu achten.

Die Fangstangen müssen im Abstand (s) von dem zu schützenden Objekt aufgestellt werden. Durch den Abstand wird der Überschlag des Blitzstroms und gefährliche Funkenbildung sicher verhindert.

## Ableitungseinrichtungen

Verbindung der Fangeinrichtung mit dem Erdungssystem



Blitzschutzklasse	Typischer Abstand a
I	10 m
II	10 m
III	15 m

#### Anzahl der Ableitungen

Die Anzahl der Ableitungen ergibt sich aus dem Umfang des zu schützenden Gebäudes – es müssen aber in jedem Fall mindestens zwei Ableitungen geschaffen werden. Dabei ist darauf zu achten, dass die Stromwege kurz und ohne Schleifen installiert werden.

#### Anzahl der Ableitungen eines getrennten LPS

Besteht die Fangeinrichtung aus Fangstangen auf getrennt stehenden Masten (oder einem Mast), die (der) nicht aus Metall oder durchverbundenem Bewehrungsstahl sind (ist), ist für jeden Mast mindes-

tens eine Ableitung erforderlich. Metallmasten oder Masten aus durchverbundenem Bewehrungsstahl benötigen keine zusätzlichen Ableitungen.

#### Anordnung der Ableitungen

Die Ableitungen sollten vorzugsweise in der Nähe der Ecken der baulichen Anlage installiert werden. Um eine optimale Aufteilung des Blitzstroms zu erzielen, müssen die Ableitungen gleichmäßig um die Außenwände der baulichen Anlage verteilt werden.

Ableitungen müssen gerade und senkrecht verlegt werden, so dass sie die kürzestmögliche direkte Verbindung zur Erde darstellen. Schleifenbildung muss vermieden werden.

Ableitungen dürfen nicht in Regenrinnen und Regenfallrohren verlegt werden, auch wenn sie mit Isolierstoff umkleidet sind.

## Berechnung des Trennungsabstandes nach ÖVE/ÖNORM EN 62305-3

Schritte	
Ermitteln Sie den Wert des Koeffizienten $k_i$	<p><math>k_i</math> ist abhängig von der gewählten Schutzklasse des Blitzschutzsystems:</p> <ul style="list-style-type: none"> <li>■ Schutzklasse I: <math>k_i = 0,08</math></li> <li>■ Schutzklasse II: <math>k_i = 0,06</math></li> <li>■ Schutzklasse III: <math>k_i = 0,04</math></li> </ul>
Ermitteln Sie den Wert des Koeffizienten $k_c$ (vereinfachtes System)	<p><math>k_c</math> ist abhängig von dem (Teil-)Blitzstrom, der in den Ableitungen fließt:</p> <ul style="list-style-type: none"> <li>■ 1 Ableitung (nur im Fall eines getrennten Blitzschutzsystems): <math>k_c = 1</math></li> <li>■ 2 Ableitungen: <math>k_c = 0,66</math></li> <li>■ 3 Ableitungen und mehr: <math>k_c = 0,44</math></li> </ul> <p>Die Werte gelten für alle Typ B Erder und für die Typ A Erder, bei denen der Erderwiderstand der benachbarten Erderelektroden sich nicht um mehr als einen Faktor von 2 unterscheiden. Wenn der Erderwiderstand von einzelnen Elektroden um mehr als einen Faktor von 2 abweicht soll <math>k_c = 1</math> angenommen werden.</p>
Ermitteln Sie den Wert des Koeffizienten $k_m$	<p><math>k_m</math> ist abhängig von dem Werkstoff der elektrischen Isolation:</p> <ul style="list-style-type: none"> <li>■ Werkstoff Luft: <math>k_m = 1</math></li> <li>■ Werkstoff Beton, Ziegel: <math>k_m = 0,5</math></li> <li>■ GFK Isolationsstangen: <math>k_m = 0,7</math></li> </ul> <p>Wenn mehrere Isolierstoffe verwendet werden, wird in der Praxis der geringste Wert für <math>k_m</math> benutzt.</p>
Ermitteln Sie den Wert L	L ist die Leitungslänge in Meter, gemessen von dem Punkt, an dem der Trennungsabstand s ermittelt werden soll, bis zum nächstliegenden Punkt des Potentialausgleichs.

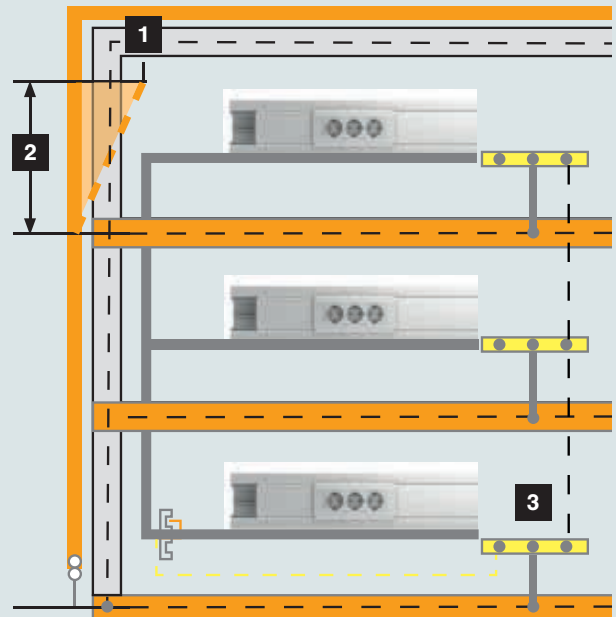
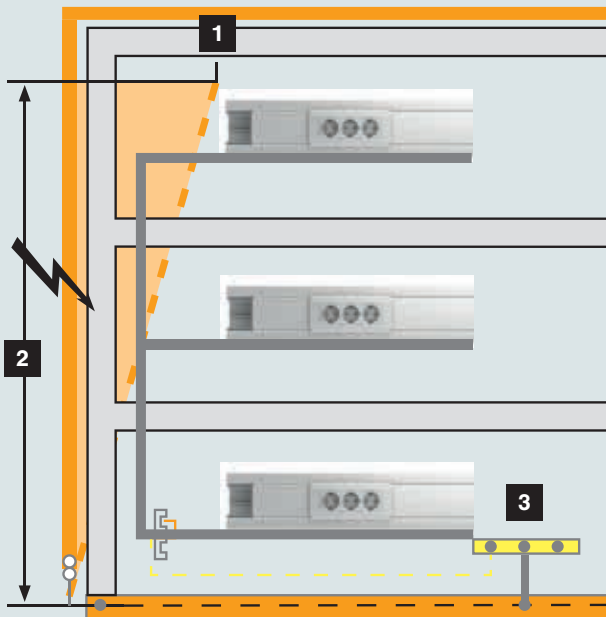
Die hochspannungsfeste isolierte Ableitung **isCon**<sup>®</sup> ist die moderne Lösung um notwendige Trennungsabstände sicher einzuhalten!



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

s = Trennungsabstand





1 Trennungsabstand (s)

3 HES

2 Länge L

### Äquipotentialflächen als Bezugsebene zur Berechnung des Trennungsabstandes bei hohen Gebäuden

Bei hohen Gebäuden kann es bei konventionellen Trennungsabstandsberechnungen zu nicht mehr realisierbaren Trennungsabständen kommen, da die Länge zur nächsten Bezugsebene (z. B. Erdungsanlage oder nächstliegender Punkt des Potentialausgleichs) bei der Kalkulation entsprechend der Gebäudemaße sehr lang ist.

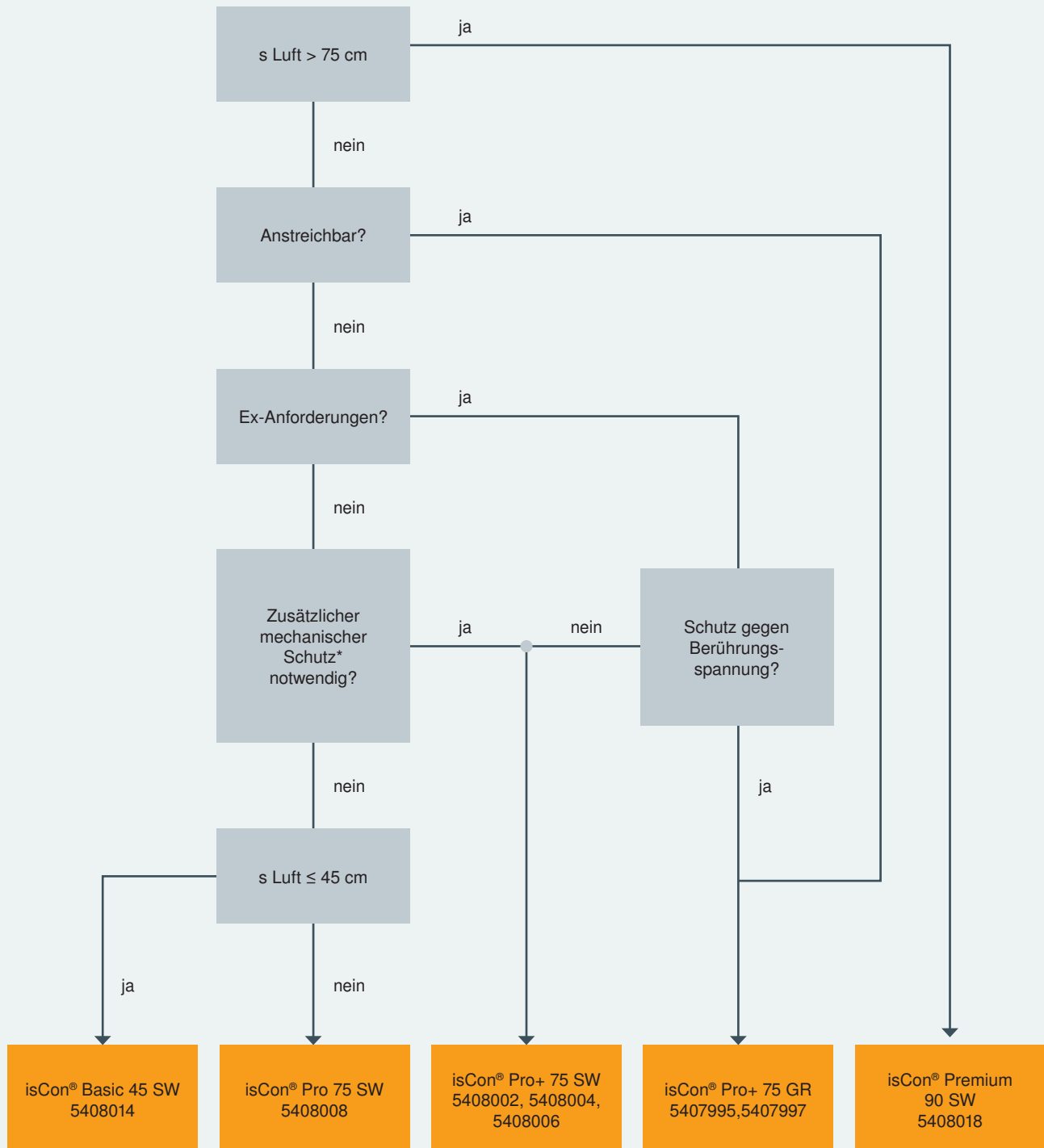
Um dennoch ein Blitzschutzsystem nach ÖVE/ÖNORM EN 62305-3 projektieren und installieren zu können, sollte man frühzeitig in der Planung die Erstellung von Äquipotentialebenen im Projekt berücksichtigen.

### Schaffung von Äquipotentialflächen z. B. jede 2-3 Etage mittels:

- Blitzschutzpotentialausgleich durch geeignete Blitzstromableiter und Überspannungsschutzgeräte für Energie- und Kommunikationseinrichtungen
- Vermaschtes Erdungssystem nach OVE E 8014
- Vermaschte Deckenbewehrung (mehrfach im Gebäude) 5 x 5 m nach ÖVE/ÖNORM EN 62305-4
- Verbindung zur Bewehrung alle 2 m
- Blitzschutzpotentialausgleich bei allen metallischen oder elektrischen Leitungen die in die Äquipotentialebenen führen (z. B. Außenkameras, Leuchten, Versorgungsleitungen, PV-Systeme etc.)

# isCon®-Ableitungen

## Auswahlhilfe



*\*Zusätzlicher mechanischer Schutz: Oberflächliche Beschädigungen des äußeren Schutzmantels beeinflussen nicht die hochspannungsfeste, isolierende Funktion der schwarzen isCon Pro+ Ableitung! Die Ummantelung muss dazu min. 0,2 mm auf dem gesamten Umfang der Ableitung erhalten sein.*

## Werkstoffe und Korrosionsschutz

### Anforderungen für einen dauerhaften Schutz

Im äußeren Blitzschutz werden vorzugsweise folgende Materialien eingesetzt: feuerverzinkter Stahl, nicht rostender Stahl (VA), Kupfer und Aluminium.

#### Korrosion

Korrosionsgefahr tritt insbesondere bei Verbindungen unterschiedlicher Werkstoffe auf. Aus diesem Grund dürfen oberhalb verzinkter Oberflächen oder ober-

halb von Aluminiumteilen keine Kupferteile eingebaut werden, da sonst durch Regen oder andere Einflüsse abgetragene Kupferteilchen auf die verzinkte Oberfläche gelangen könnten. Zudem entsteht ein galvanisches Element, das die Kontaktfläche schneller korrodieren lässt.

### Materialkombinationen ohne erhöhte Korrosionsgefahr

	Stahl, verzinkt	Aluminium	Kupfer	Edelstahl	Titan	Zinn
Stahl, verzinkt	ja	ja	nein	ja	ja	ja
Aluminium	ja	ja	nein	ja	ja	ja
Kupfer	nein	nein	ja	ja	nein	ja
Edelstahl	ja	ja	ja	ja	ja	ja
Titan	ja	ja	nein	ja	ja	ja
Zinn	ja	ja	ja	ja	ja	ja

Werkstoff	Form	Mindestmaße
<b>Kupfer verzinntes Kupfer</b>	Band massiv	20 x 2,5 mm
	Rund massiv (b)	ø 8 mm
	Seil (b)	50 mm <sup>2</sup>
	Rund massiv	ø 15 mm
<b>Aluminium</b>	Rund massiv	ø 8 mm
	Seil	50 mm <sup>2</sup>
<b>Kupferbeschichtete Aluminiumlegierung</b>	Rund massiv (c)	ø 8 mm
<b>Aluminiumlegierung</b>	Band massiv	20 x 2,5 mm
	Rund massiv	ø 8 mm
	Seil (b)	50 mm <sup>2</sup>
	Rund massiv	ø 15 mm
<b>Feuerverzinkter Stahl</b>	Band massiv	20 x 2,5 mm
	Rund massiv	ø 8 mm
	Seil (b)	50 mm <sup>2</sup>
	Rund massiv	ø 15 mm
<b>Kupferbeschichteter Stahl (c)</b>	Rund massiv	ø 8 mm
	Band massiv	20 x 2,5 mm
<b>Nichtrostender Stahl (a)</b>	Band massiv	20 x 2,5 mm
	Rund massiv	ø 8 mm
	Seil (b)	50 mm <sup>2</sup>
	Rund massiv (d)	ø 15 mm

Werkstoff, Form und Mindestmaße von Fangleitungen, Fangstangen, Erdeinführungsstangen und Ableitungen

- (a) Chrom  $\geq$  16 %; Nickel  $\geq$  8 %; Kohlenstoff  $\leq$  0,08 %
- (b) Durchmesser 8 mm darf in bestimmten Anwendungen auf 28 mm<sup>2</sup> (Durchmesser 6 mm) reduziert werden, wenn die mechanische Festigkeit keine wesentliche Anforderung ist.
- (c) Mindestens 70  $\mu$ m Kupfereauflage mit 99,9 % Kupfergehalt
- (d) Anwendbar für Fangstangen und Basis



Werkstoff	Form	Mindestmaße		
		Staberder	Erdleiter	Plattenerder
<b>Kupfer verzinntes Kupfer</b>	Seil			
	Rund massiv			
	Band massiv		50 mm <sup>2</sup>	
	Rund massiv	ø 15 mm	ø 8 mm	
	Gitterplatte	ø 20 mm	20 x 2,5 mm	
	Rohr			500 x 500 mm
	Platte massiv			600 x 600 mm
<b>Feuerverzinkter Stahl</b>	Rund massiv			
	Rund massiv	ø 14 mm		
	Rohr	ø 25 mm	ø 10 mm	
	Band massiv			
	Platte massiv			
	Gitterplatte		30 x 3 mm	500 x 500 mm
	Profil (a)	290 mm <sup>2</sup>		600 x 600 mm
<b>Blanker Stahl (b)</b>	Seil		70 mm <sup>2</sup>	
	Rund massiv	ø 8 mm	ø 10 mm	
	Band massiv		25 x 3 mm	
<b>Kupferbeschichteter Stahl (c)</b>	Rund massiv		ø 8 mm	
	Rund massiv	ø 14 mm	ø 10 mm	
	Band massiv		30 x 3 mm	
<b>Nichtrostender Stahl (d)</b>	Rund massiv		ø 10 mm	
	Rund massiv			
	Band massiv	ø 15 mm	30 x 3,5 mm	

Werkstoff, Form und Querschnitt von Erdern nach OVE EN IEC 62561-2

- (a) Es sind unterschiedliche Profile mit einem Querschnitt von 290 mm<sup>2</sup> und einer Mindestdicke von 3 mm zugelassen, z. B. Kreuzprofile.  
(b) Muss in einer Tiefe von mindestens 50 mm in Beton eingebettet sein.  
(c) Bei mindestens 250 µm Kupferauflage mit 99,99 % Kupfergehalt.  
(d) Chrom ≥ 16 %; Nickel ≥ 5 %; Molybdän ≥ 2 %; Kohlenstoff ≤ 0,08 %.

# Blitz- und Überspannungsschutzsysteme

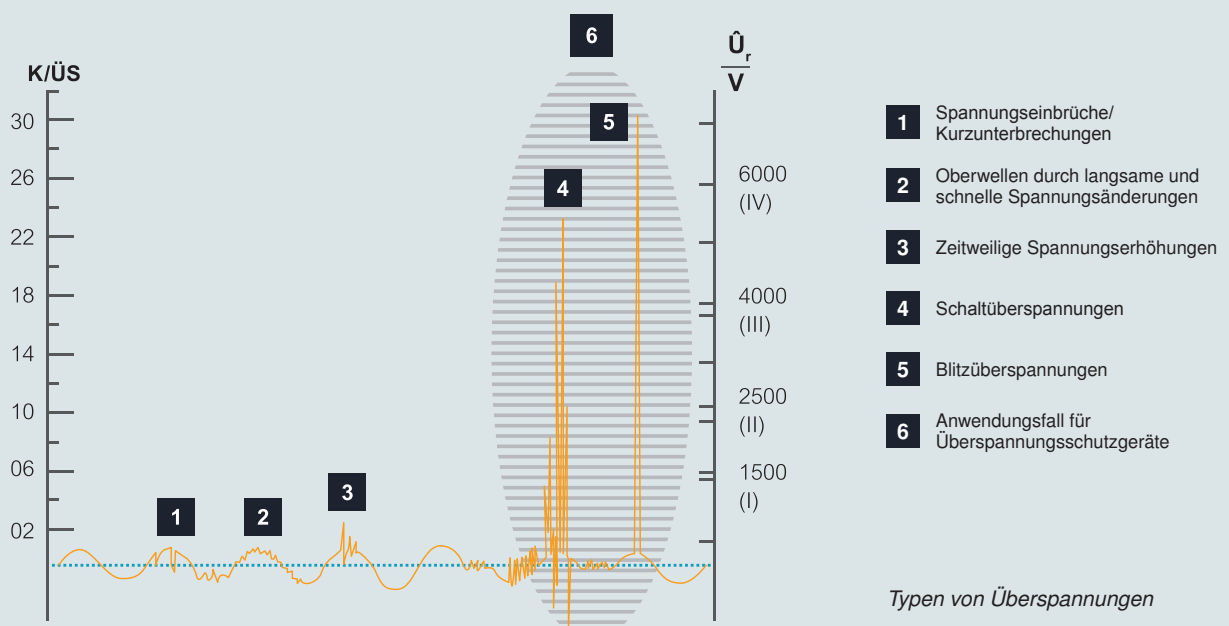
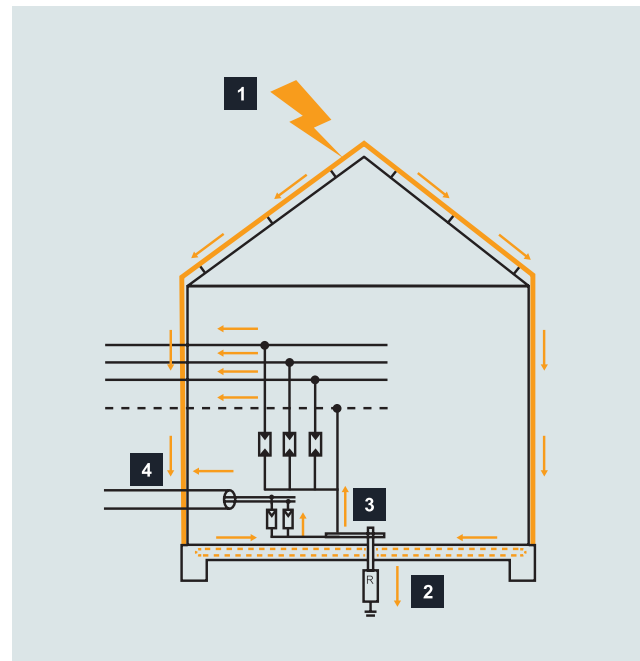
Bei einem Blitzeinschlag werden über das Erdungssystem nur 50 % der Blitzenergie ins Erdreich abgeleitet. Die andere Hälfte fließt in die elektrische Installation der baulichen Anlage. Weitere Gründe für Überspannungen sind ferne

Blitzeinschläge oder Schalthandlungen. OBO Blitzstrom- und Überspannungsableiter schützen sicher die sensiblen elektrischen Geräte in der Anlage vor Schäden durch Überspannungen.

Die höchsten Überspannungen werden durch Blitzeinschläge erzeugt. Nach der ÖVE/ÖNORM EN 62305 werden Blitzeinschläge mit Blitzstoßströme von bis zu 200 kA (10/350  $\mu$ s) simuliert.

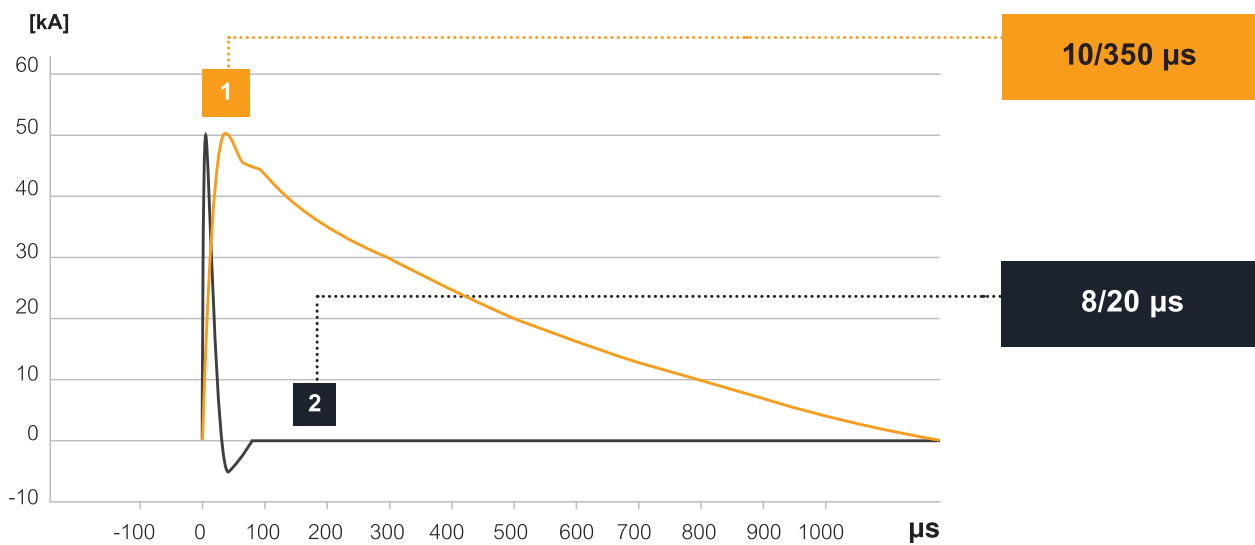
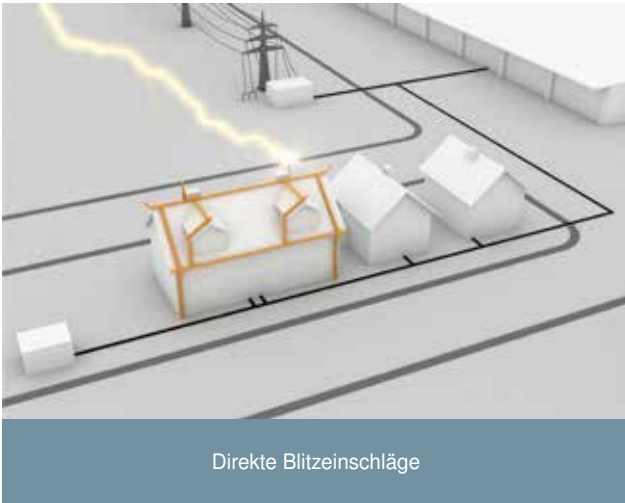
<b>1</b>	Einschlag	100 %	$I_{imp} = \max 200 \text{ kA}$ (IEC/EN 62305)
<b>2</b>	Erdungssystem	~ 50 %	$I = 100 \text{ kA}$
<b>3</b>	Elektrische Installation	~ 50 %	$I = 100 \text{ kA}$
<b>4</b>	Datenleitung	~ 5 %	$I = 5 \text{ kA}$

Typische Aufteilung des Blitzstroms



## Ursachen für Schäden

Vor allen gezeigten Schadensursachen kann man Geräte und Systeme durch OBO-Überspannungsableiter schützen.



### Impulsarten und ihre Charakteristik:

**1** Impulsform 1, direkter Blitzeinschlag, 10/350-µs-simulierter Blitzimpuls

**2** Impulsform 2, entfernter Blitzeinschlag oder Schaltvorgang, 8/20-µs-simulierter Blitzimpuls (Überspannung)

## Überspannungsschutzsysteme für die Energietechnik

Überspannungsschutzgeräte sorgen für einen kontrollierten Potentialausgleich der spannungsführenden Netzleitungen. Sie reagieren noch bevor die Isolation in elektrischen und elektronischen Geräten durch Überspannungen zerstört werden kann.

### Blitzstromableiter Typ 1/class I

### Kombiableiter Typ 1+2/class I+II

TN-C-System: Blitzstromableiter vom Typ 1/class I und Kombiableiter Typ 1+2/class I+II werden 3-polig (z. B. dreimal MCD 50-B) eingesetzt.

TN-S und TT-System: Blitzstrom- und Kombiableiter werden in der 3+1-Schaltung (z. B. dreimal MC 50-B und einmal MC 125-B NPE) eingesetzt. Bei der 3+1-Schaltung werden die Außenleiter (L1, L2, L3) über Ableiter an den Neutralleiter (N)

angeschlossen. Der Neutralleiter (N) wird über eine Summenfunkenstrecke mit dem Schutzleiter (PE) verbunden. Nach Abstimmung mit dem örtlichen Energieversorger ist auch der Einsatz vor der Hauptzähleinrichtung möglich.

### Überspannungsableiter Typ 2/class II

Überspannungsableiter vom Typ 2/class II werden in der 3+1-Schaltung (z. B. V20 - 3+NPE) eingesetzt. Bei der 3+1-Schaltung werden die Außenleiter (L1, L2, L3) über Ableiter an den Neutralleiter (N) angeschlossen. Der Neutralleiter (N) wird über eine Summenfunkenstrecke mit dem Schutzleiter (PE) verbunden. Die Ableiter müssen vor einem Fehlerstrom-Schutz (RCD) eingesetzt werden, da dieser sonst den abgeleiteten Stoßstrom als Fehlerstrom interpretiert und den Stromkreis unterbricht.



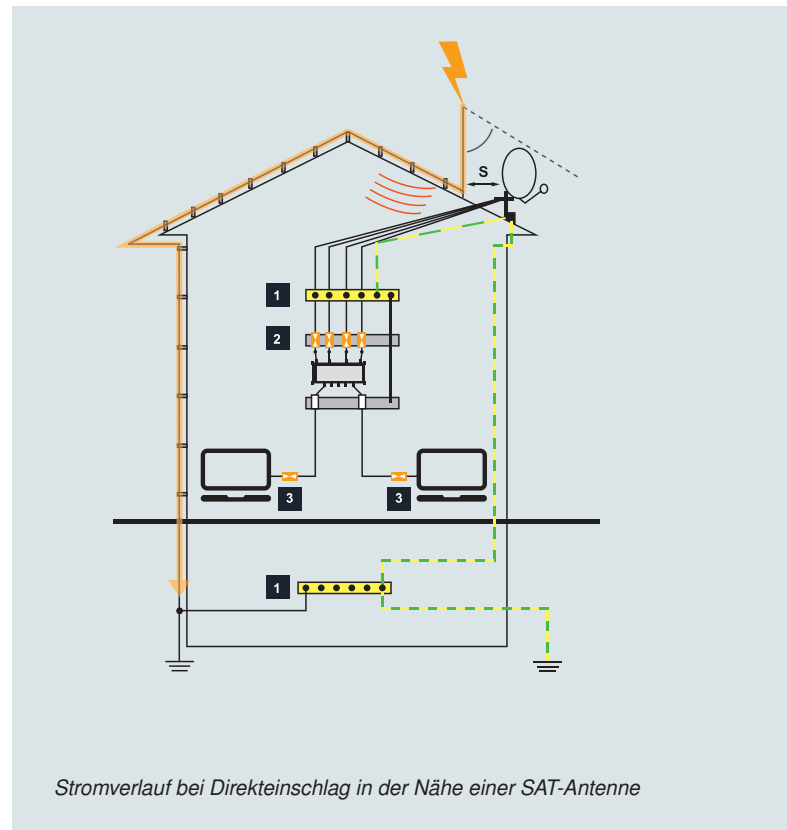
### Blitz- und Überspannungsschutz für Satellitenanlagen nach ÖVE/ÖNORM EN 60728-11

SAT-Anlagen bzw. Antennen gehören zu Objekten, die häufig auf Dächern installiert und als exponierte Objekte neben den Fangstangen ausgeführt sind. Aus diesem Grund müssen diese Anlagen vor direkten Blitzeinschlägen mittels Fangstangen geschützt werden, um nicht selber als Blitzfangeinrichtung zu dienen. Idealerweise befindet sich nach Aufbau des Blitzschutzsystems die SAT-Antenne innerhalb des Schutzwinkels der Fangstange. In diesem Falle wird die Gefahr eines direkten Blitzeinschlages in die SAT-Leitungen nahezu ausgeschlossen.

Jedoch werden bei einem Einschlag in die Fangstange Überspannungen eingekoppelt.

Diese Überspannungen können mit einem Überspannungsschutzgerät wie dem OBO TV 4+1 (zum Schutz von bspw. Multiswitches) oder FC-SAT-D (zum Schutz eines TV-Gerätes) sicher, auf einen für das zu schützende Gerät ungefährlichen Pegel, begrenzt werden.

Als wichtige Voraussetzung gilt, dass auch der Trennungsabstand (s) zwischen Fangstange und Antennenanlage eingehalten wird. Der Blitz- und Überspannungsschutz einer SAT-Anlage wird in den folgenden Bildern gezeigt:

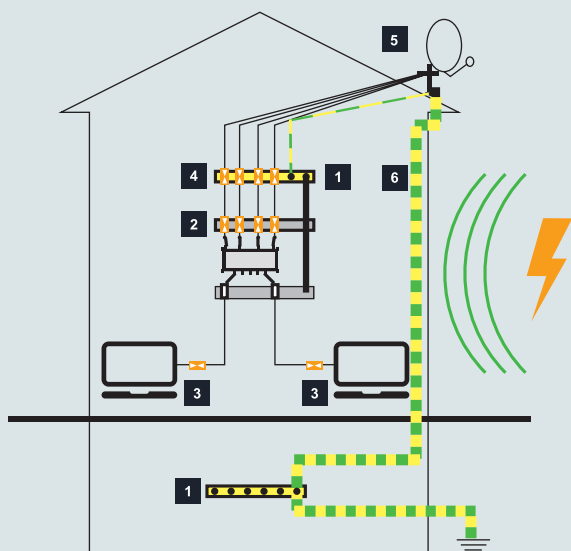


Produkt	Art.-Nr.
1 Potentialausgleichsschiene z. B. OBO 1801 VDE	5015650
2 Koaxialer Überspannungsschutz z. B. TV 4+1	5083400
3 Feinschutzgerät für SAT- und 230-V-Zuleitung z. B. OBO FC-SAT-D	5092816

Durch Koordination der Blitz- und Überspannungsschutzkomponenten können Blitzströme und Überspannungen sicher abgeleitet werden. Besitzt das Gebäude keinen äußeren Blitzschutz, besteht durch die exponierte Installation der SAT-Anlage die Gefahr des Direkteinschlages, wie bei einer Fangstange. Aus diesem Grund muss der Überspannungsschutz

mit Blitzstromableitern der Klasse D1 ergänzt werden. Neben der üblichen Antennenenerdung mit 4 mm<sup>2</sup> Cu, muss die Antennenanlage zusätzlich mit einem mindestens 16-mm<sup>2</sup>-Cu Erdungsleiter mit der Haupterdungsschiene verbunden sein.





Induktion von Überspannung in ein SAT-System

Sollte eine Risikoanalyse nach ÖVE/ÖNORM EN 62305-2 nicht möglich oder behördlich nicht notwendig sein, so kann es bei statischen atmosphärischen Überspannungen (z. B. Blitzen) zum Überschlag vom 16-mm<sup>2</sup>-Erdleiter zur Elektro-installation oder der Antennenanlage des Gebäudes kommen. Daher empfiehlt es sich, den Erdleiter hochspannungsfest, isolierend auszuführen sowie Gleitentladungen durch geeignete Maßnahmen zu verhindern.

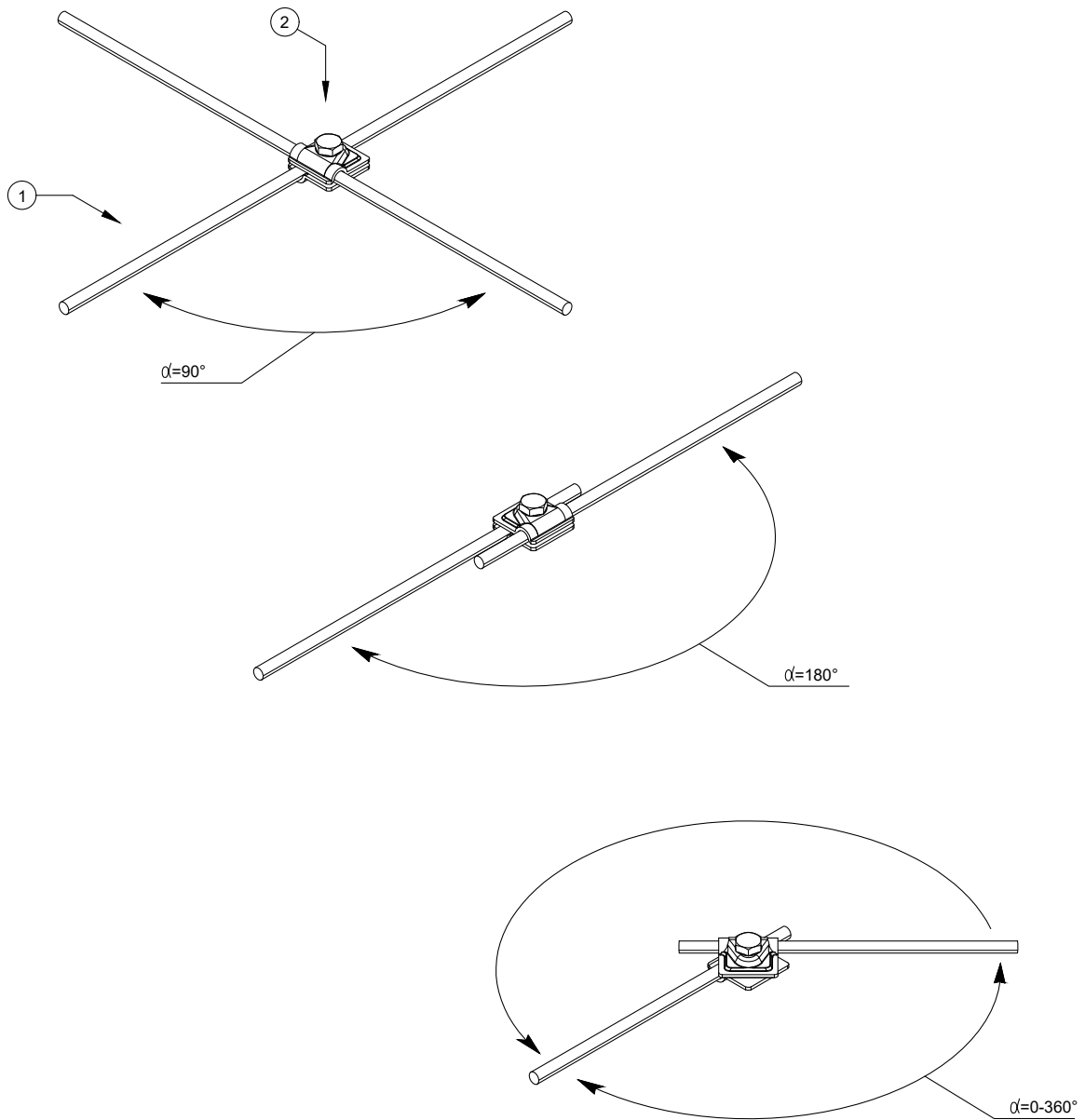
	Produkt	Art.-Nr.
1	Potentialausgleichsschiene z. B. OBO 1801 VDE	5015650
2	Koaxialer Überspannungsschutz z. B. TV 4+1	5083400
3	Feinschutzgerät für SAT- und 230-V-Zuleitung z. B. OBO FC-SAT-D	5092816
4	Blitzstromableiter OBO DS-F	5093275/5093272
5	Antennenerdung 4 mm <sup>2</sup> Cu	-
6	Erdungsleiter mind. 16 mm <sup>2</sup> Cu	-



# OBO Typicals - Montagedetailzeichnungen von Blitzschutz-, Erdungs- und Potentialausgleichssystemen

<b>1</b>	<b>External lightning protection systems for flat roofs</b>	<b>S. 28</b>
	Connection Components	
	Fastener for flat roofs	
	Thermal expansion pieces	
	Example applications	
<b>2</b>	<b>External lightning protection systems for flat roof equipment</b>	<b>S. 52</b>
	FangFix air-terminations systems	
	FangFix junior air-termination systems	
	Standard isolated systems	
	isfang air-termination system	
<b>3</b>	<b>External lightning protection systems for pitched roofs</b>	<b>S. 72</b>
<b>4</b>	<b>Down-conductors</b>	<b>S. 96</b>
<b>5</b>	<b>Lightning strike counter</b>	<b>S. 106</b>
<b>6</b>	<b>Isolated lightning protection systems</b>	<b>S. 108</b>
	High-voltage-resistant, isolated installations with isCon® conductors	
	iRod – Air-termination systems $\geq 10$ m	
<b>7</b>	<b>Earthing system</b>	<b>S. 118</b>
	Earth rods	
	Ring systems	
	Foundation earth electrodes	
	Portable grounding system	
<b>8</b>	<b>Equipotential bonding systems</b>	<b>S. 132</b>

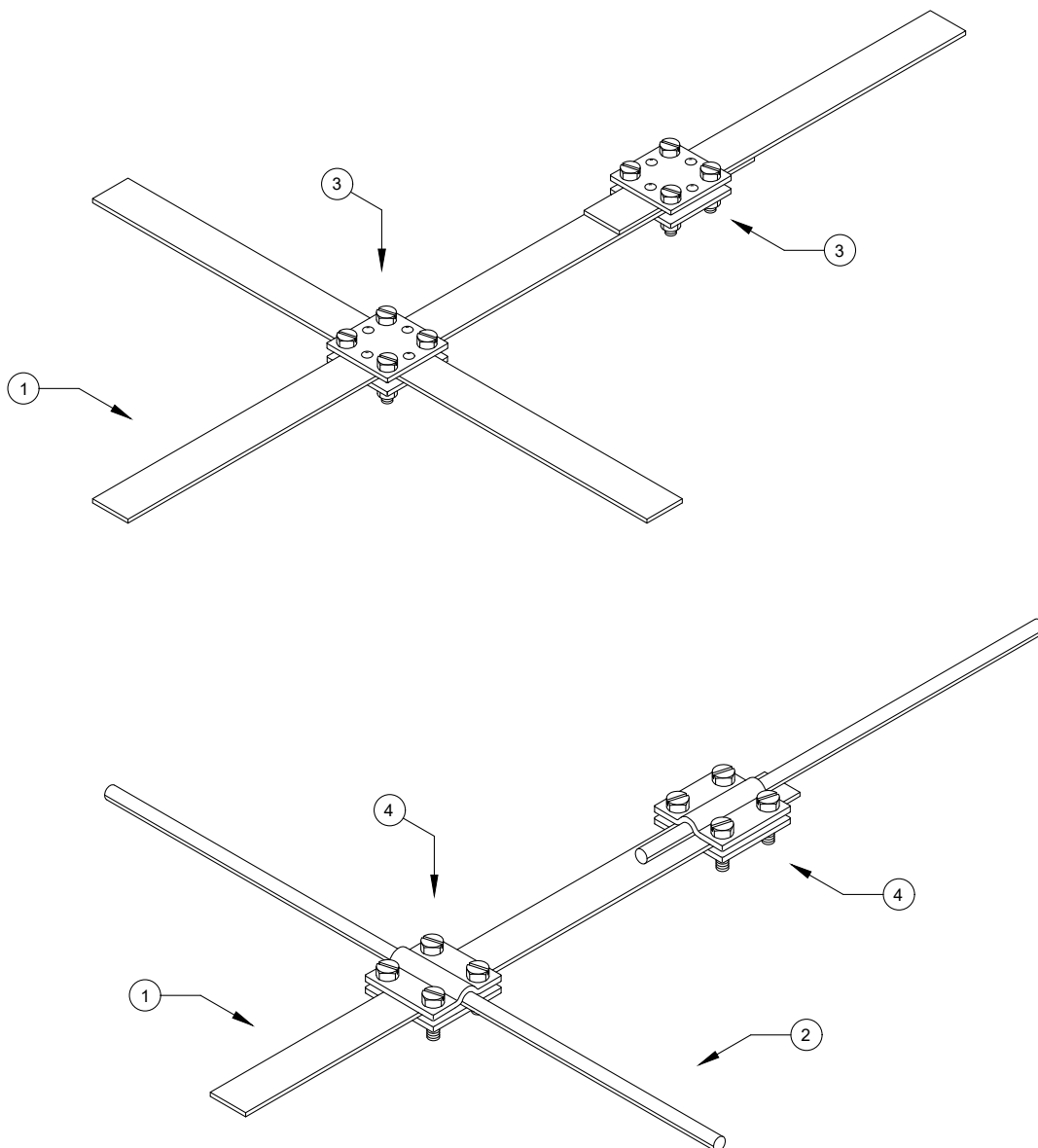
# 1 External lightning protection systems for flat roofs





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5311519	249 8-10 ALU	Vario quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.01	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roofs			
Editor:		Comment:			
Status:		Methods of longitudinal and transverse connection of round conductors			
	— — —			<b>OBO</b>	Scale:
	— — —			<b>BETTERMANN</b>	Sheet size:
Ind.	Amendment typical	Date:	Name:	Sheet:	of:

# 1 External lightning protection systems for flat roofs

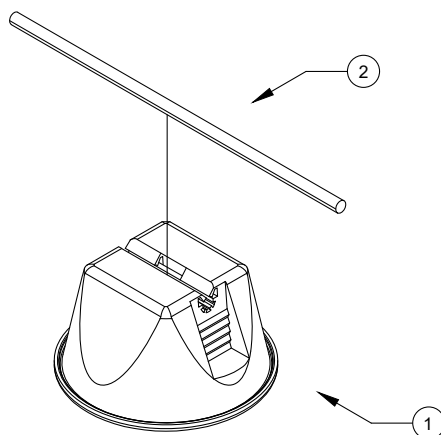


	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Galvanised steel, flat conductor	
2	5021081	RD 8-FT	Galvanised steel, round conductor	
3	5314658	256 A-DIN 30 FT	Cross-connector for flatconductor	
4	5312655	252 8-10 x FL30 FT	Cross-connector for round and flat conductors	

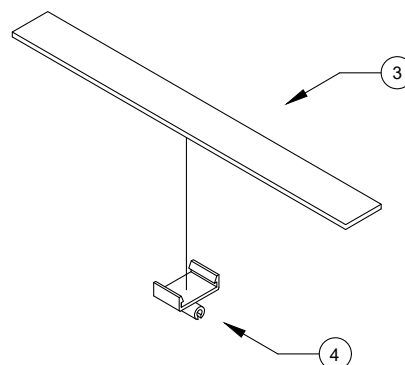
Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.02	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs  Comment: Methods of longitudinal and transverse connection of flat and round conductors			
Creator:					
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		

# 1 External lightning protection systems for flat roofs

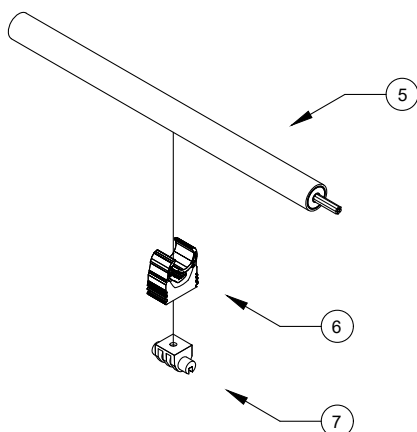
1 Fixing the round conductor



2 Fixing the flat conductor



3 Fixing the isCon conductor

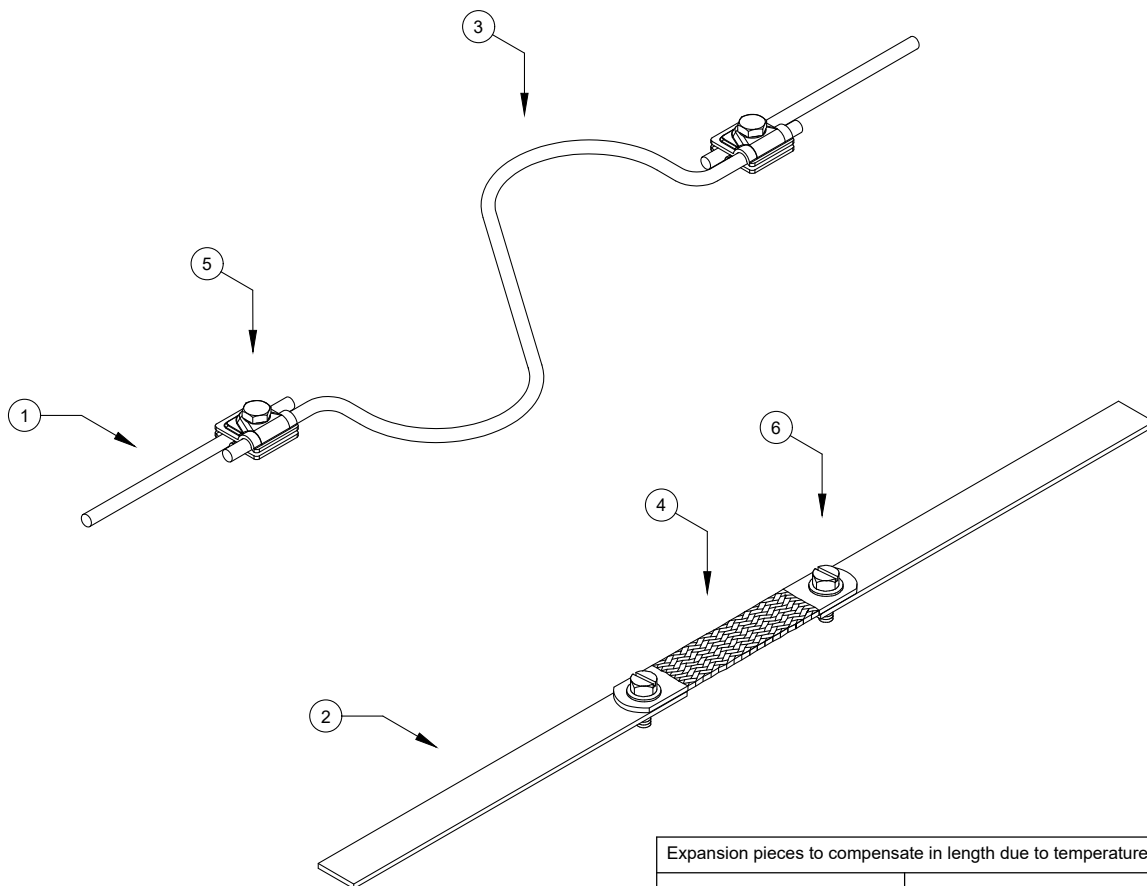


	Item No.	Designation	Description	Q-ty
1	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
2	5021294	RD 8-ALU T	Round conductor, aluminium	
3	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
4	5218885	165 MBG HFL	Flat conductor adapter for roof conductor holder	
5	5408008	isCon Pro 75 SW	isCon conductor, Pro	
6	2153114	M-Quick 18-22 LGR	Multi-Quick clip	
7	5218882	165 MBG UH	Universal flat conductor adapter for roof conductor holder	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.03	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs			
Creator:		Comment: Methods of mounting various conductors on a flat roof surface			
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		Sheet: of:



# 1 External lightning protection systems for flat roofs

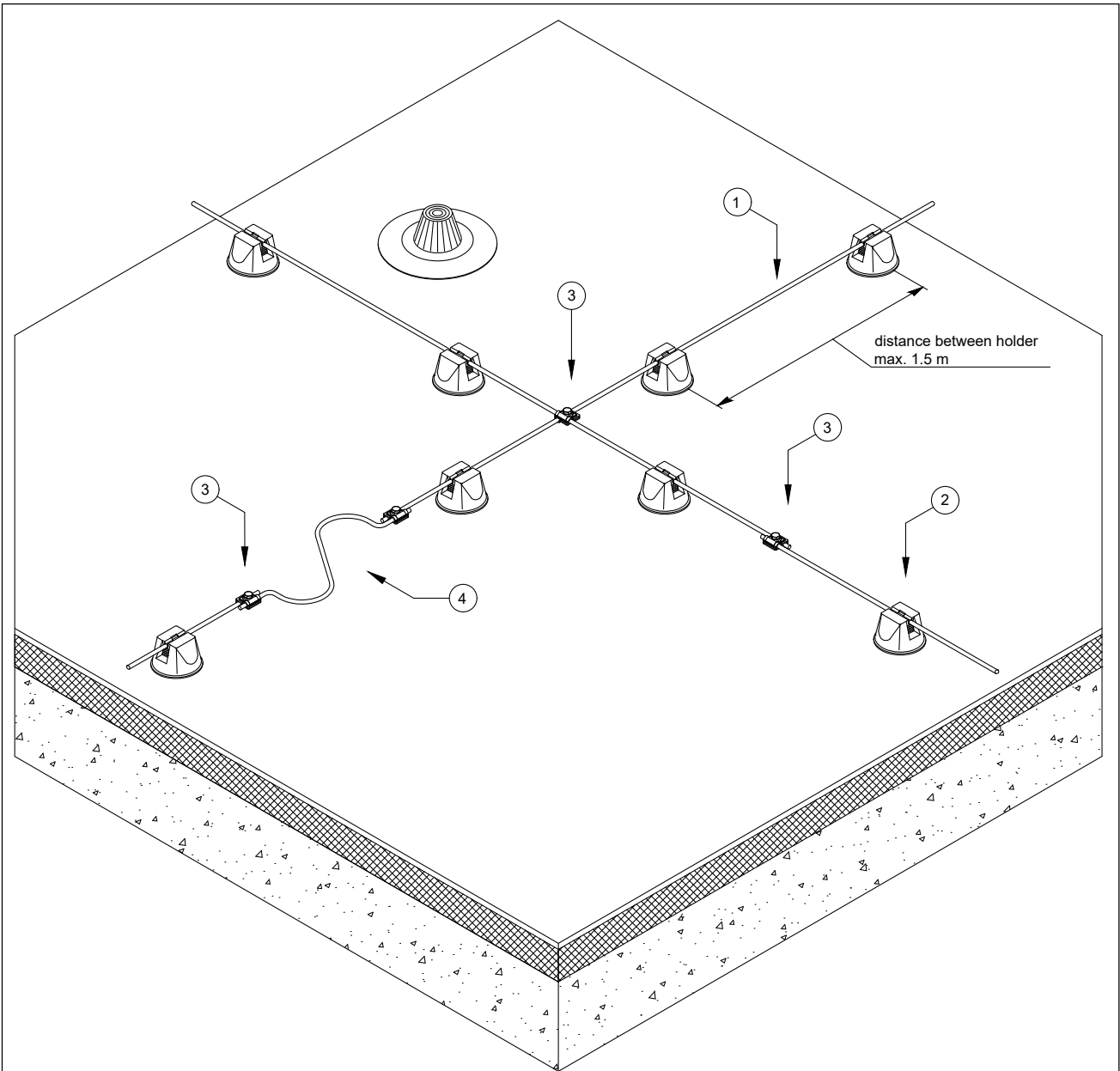


Expansion pieces to compensate in length due to temperature	
Material	Expansion piece spacing in m
Steel	15
Stainless steel	10
Copper	10
Aluminium	10

	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
3	5218926	172 AR	Expansion piece	
4	5331501	856	Connection and expansion strip	
5	5311519	249 8-10 ALU	Vario quick connector	
6	3160734	SKS 10x25 F	Hexagonal bolt with nut and washer M10	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.04	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs			
Creator:		Comment: Installation of thermal expansion compensators for conductors			
Editor:					
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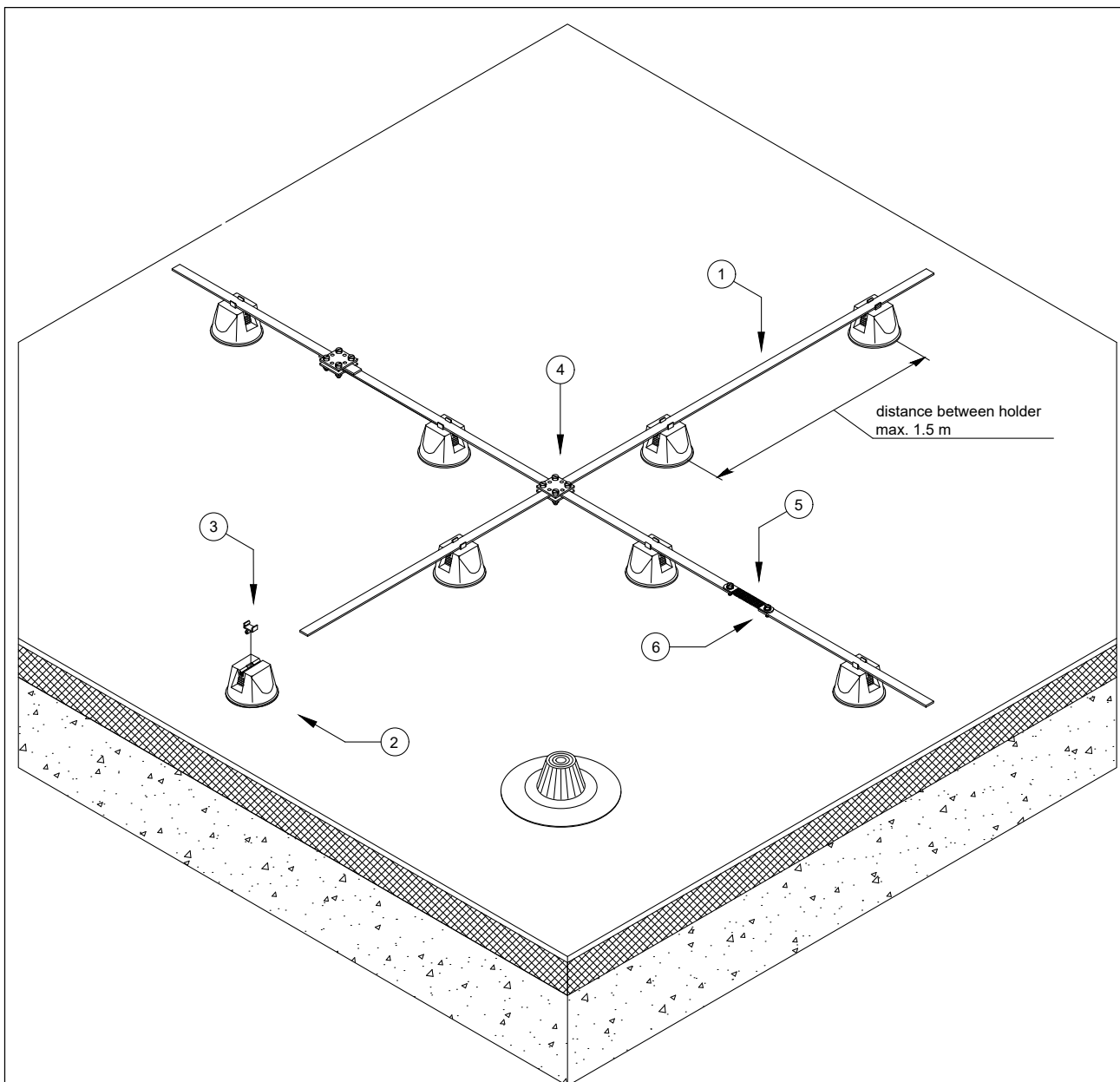
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5311519	249 8-10 ALU	Vario quick connector	
4	5218926	172 AR	Expansion piece	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.05	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs			
Creator:		Comment: Installation of a lightning protection grid with round conductor on the roof surface			
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		Sheet: of:

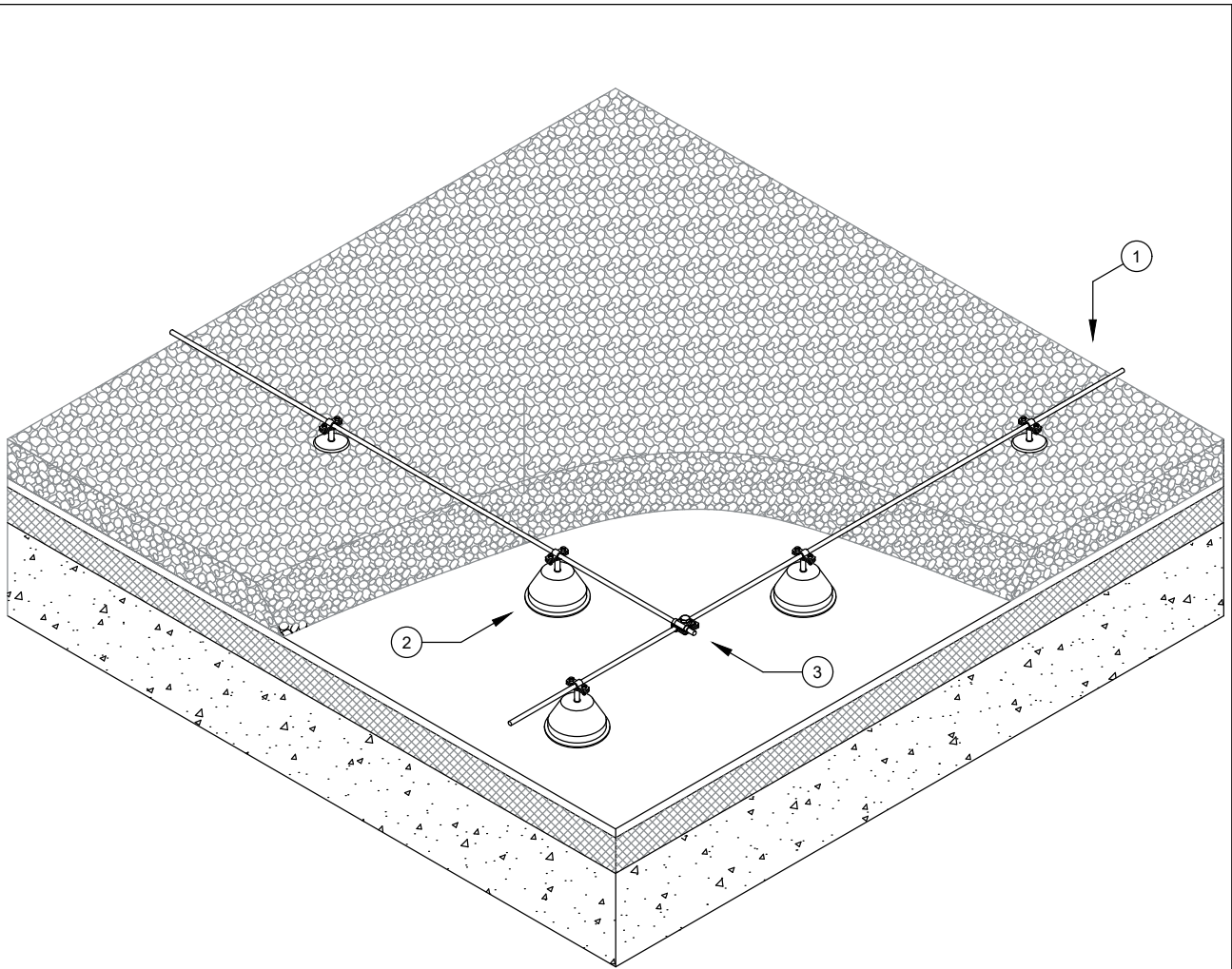
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5218885	165 MBG HFL	Flat conductor adapter for roof conductor holder	
4	5314658	256 A-DIN 30 FT	DIN cross-connector for flat conductor	
5	5331501	856	Connection and expansion strip	
6	3160734	SKS 10x25 F	Hexagonal bolt with nut and washer	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.06	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs  Comment: Installation of a lightning protection grid with flat conductor on the roof surface			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

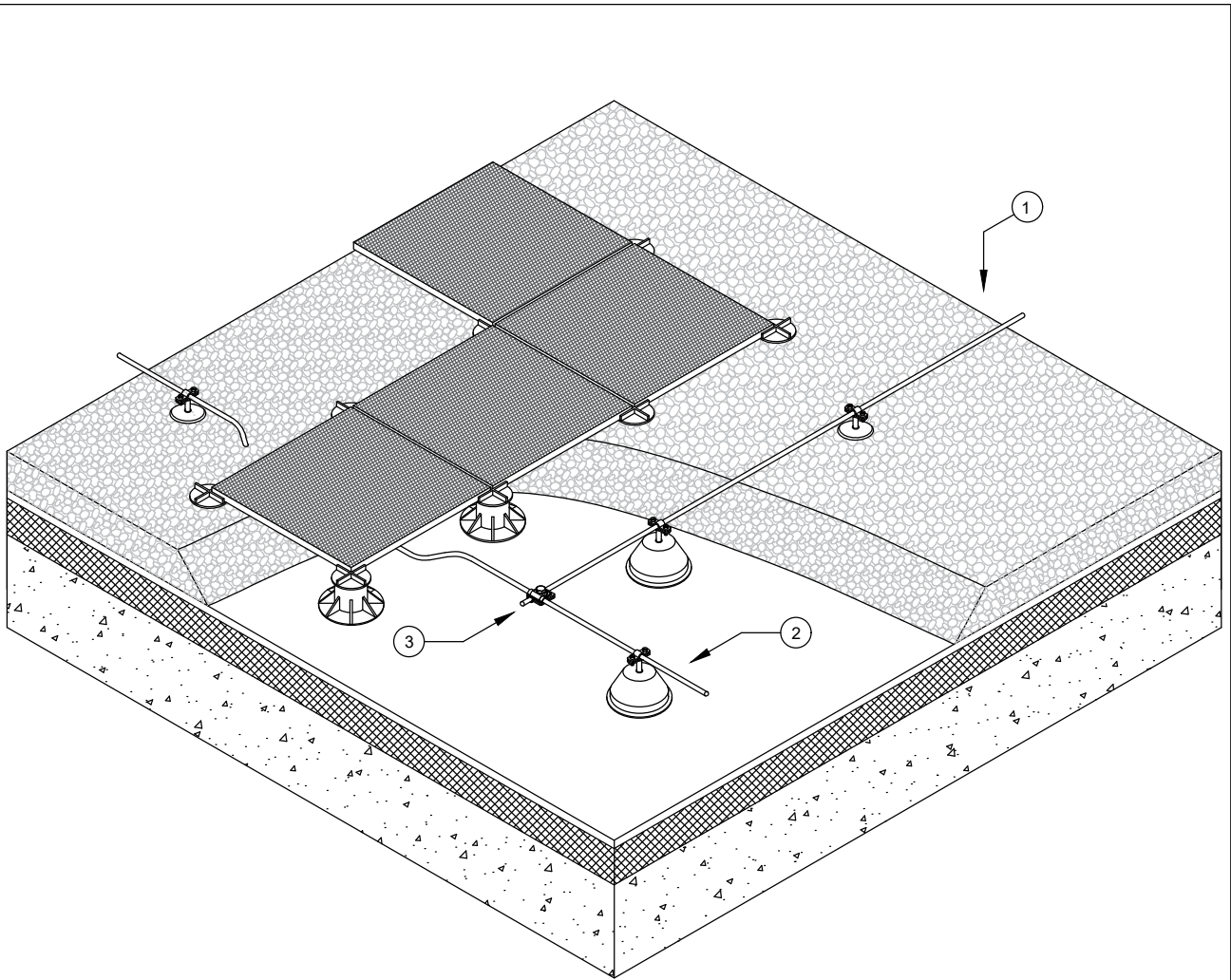
# 1 External lightning protection systems for flat roofs



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5218977	165 KRB SO	Roof conductor holder for flat roofs	
3	5311519	249 8-10 ALU	Vario quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.07	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for flat roofs  Comment: Installation of lightning protection grid with round conductor on the surface of the bulk roof		
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:	 Scale: Sheet: of:	

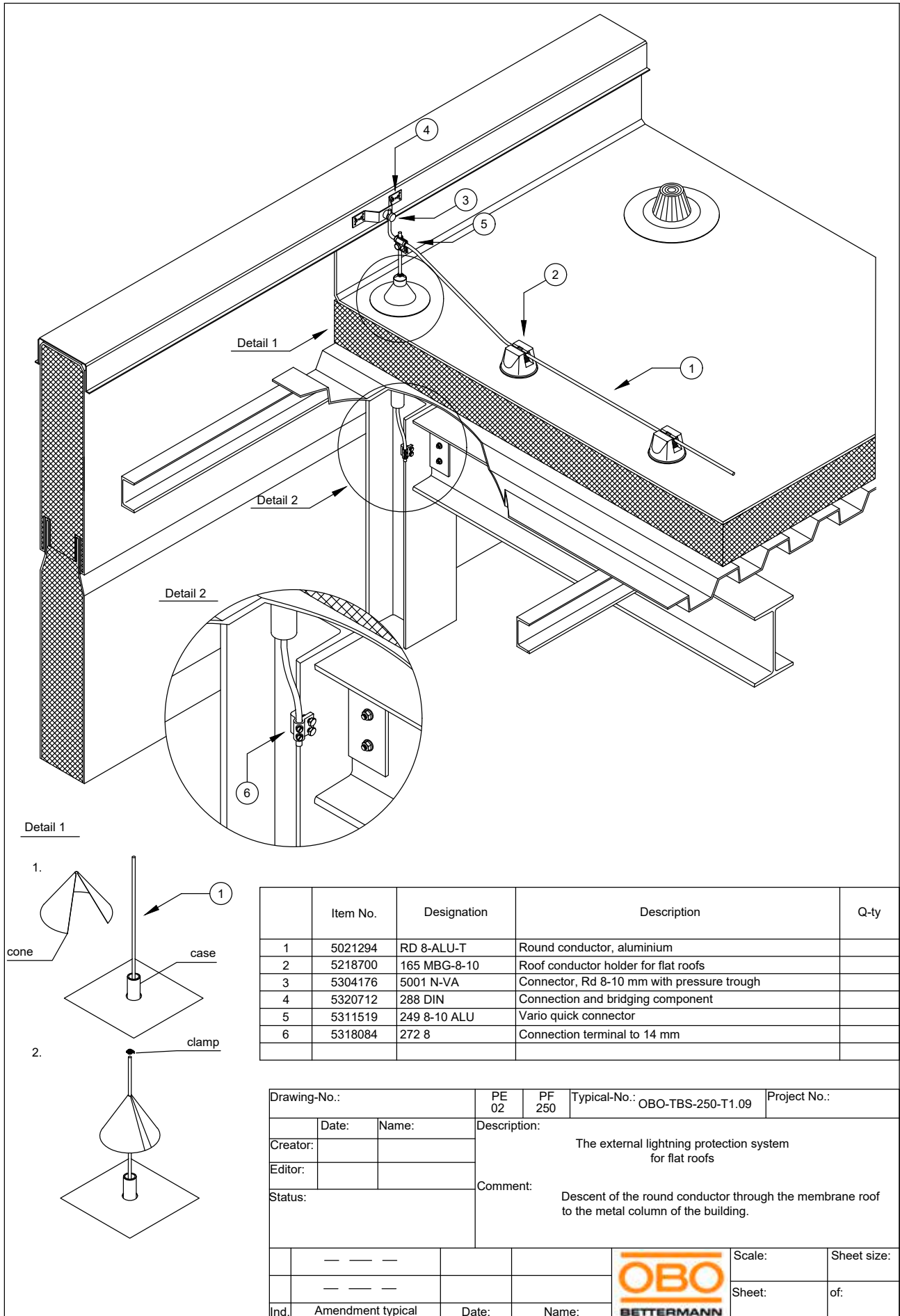
# 1 External lightning protection systems for flat roofs



	Item No.	Designation	Description	Q-ty
	1	5021294	RD 8-ALU-T	Round conductor, aluminium
	2	5218977	165 KRB SO	Roof conductor holder for flat roofs
	3	5311519	249 8-10 ALU	Vario quick connector

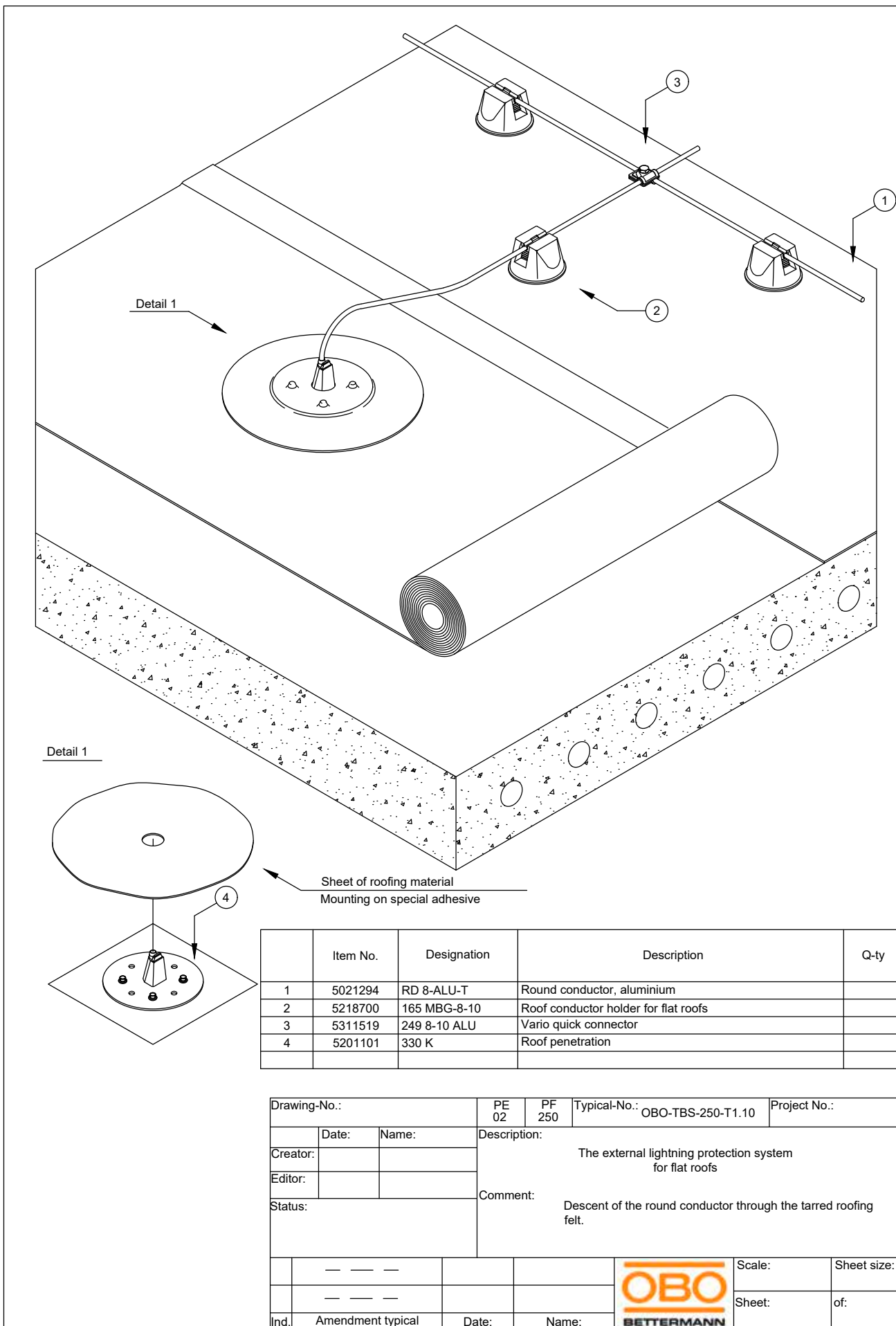
Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.08	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for flat roofs		
Editor:			Comment: Installation of lightning protection grid with round conductor on the surface of the bulk roof		
Status:					
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Ind.	Amendment typical	Date:	Name:		Sheet: of:

# 1 External lightning protection systems for flat roofs





# 1 External lightning protection systems for flat roofs

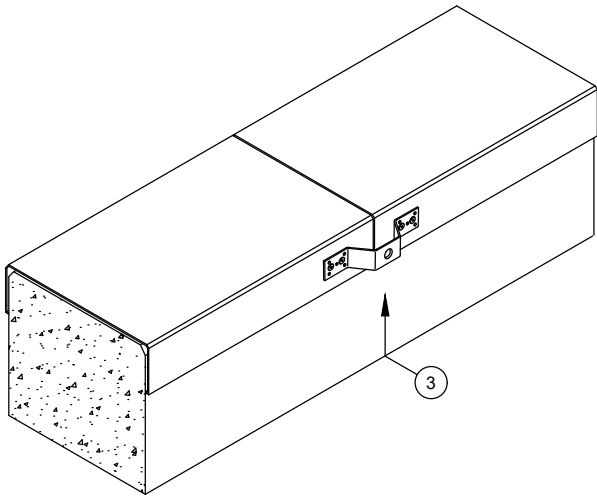


	Item No.	Designation	Description	Q-ty
	1	5021294	RD 8-ALU-T	Round conductor, aluminium
	2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs
	3	5311519	249 8-10 ALU	Vario quick connector
	4	5201101	330 K	Roof penetration

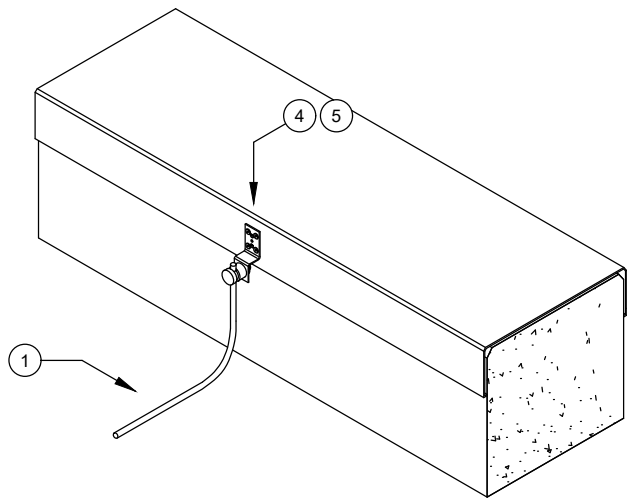
Drawing-No.:		PE 02	PF 250	Typical-No.:	OBO-TBS-250-T1.10	Project No.:
Date:	Name:	Description:				
Creator:		The external lightning protection system for flat roofs				
Editor:		Comment:				
Status:		Descent of the round conductor through the tarred roofing felt.				
	— — —			<b>OBO</b>	Scale:	Sheet size:
	— — —			<b>BETTERMANN</b>	Sheet:	of:
Ind.	Amendment typical	Date:	Name:			

# 1 External lightning protection systems for flat roofs

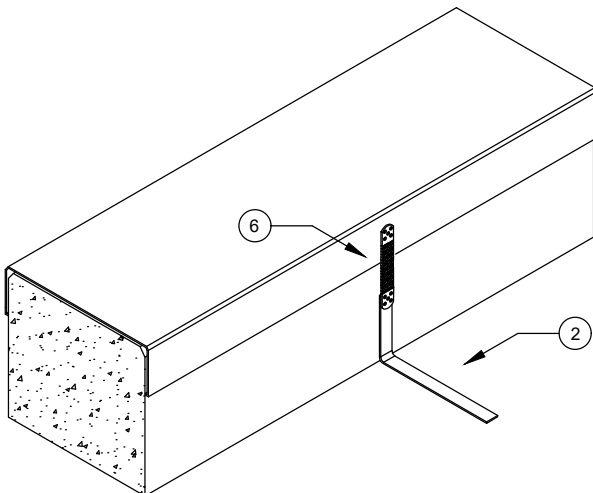
① Mounting on 2 blind rivets d = 6 mm



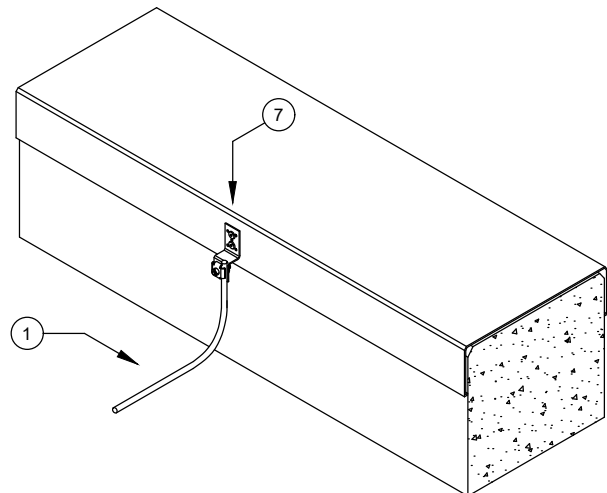
② Mounting on 4 blind rivets d = 5 mm




③ Mounting on 5 blind rivets d = 3,5 mm



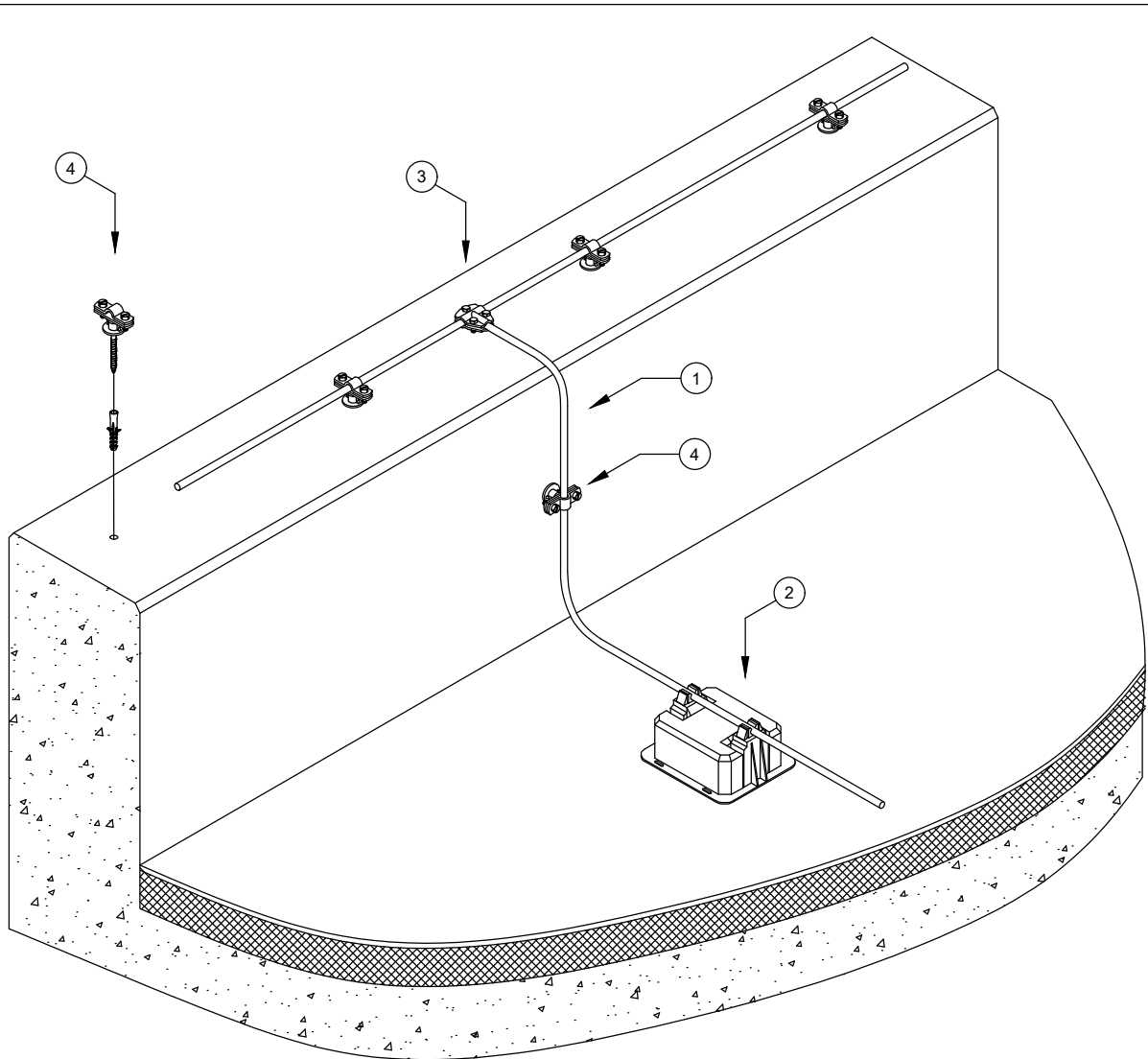
④ 2 blind rivets made of stainless steel VA d = 6,3 mm




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
3	5320712	288 DIN	Connection and bridging component	
4	5320704	287	Connection component	
5	5304176	5001 N-VA	Connector, Rd 8-10 mm with pressure trough	
6	5331501	856	Connection and expansion strip	
7	5320707	287 DCT	Connection component with double crossbar	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.11	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs  Comment: Methods of connecting the metal parapet wall to the lightning protection grid using rivets.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

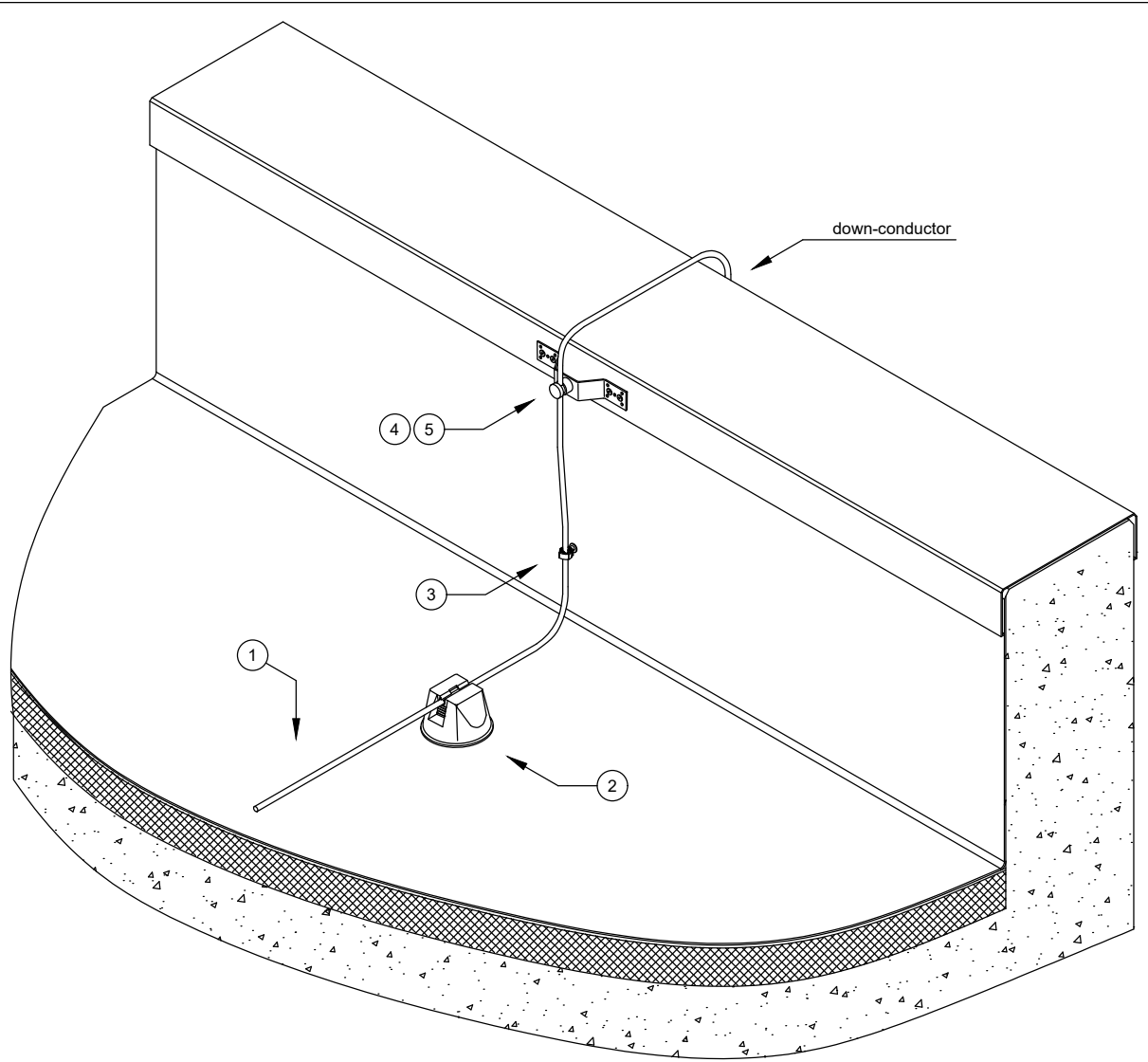
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5218997	165 R-8-10	Roof conductor holder for flat roofs	
3	5311209	247 8-10 FT	T connector Rd 8-10 mm, triple -screwed	
4	5230322	113 B-Z-HD	Conductor bracket with crossbar, wood screw, plastic anchor	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.12	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roofs			
Editor:		Comment:			
Status:		Fixing a round conductor to a flat parapet wall.			
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
					Sheet: of:

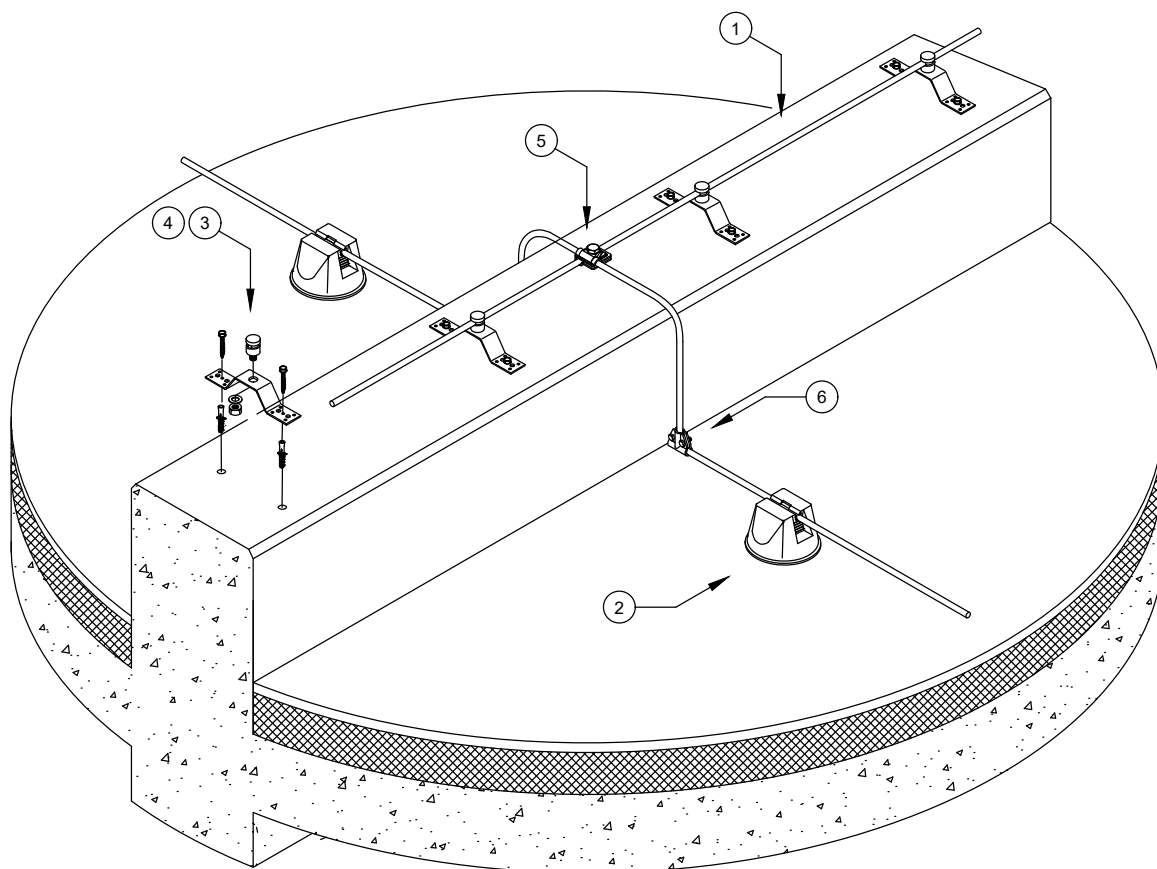
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5207444	177 20 M8	Universal cable bracket	
4	5320712	288 DIN	Connection and bridging component	
5	5304164	5001 N-FT	Connector, Rd 8-10 mm with pressure trough	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.13	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for flat roofs  Comment: Fixing a round conductor to a metal parapet wall.		
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

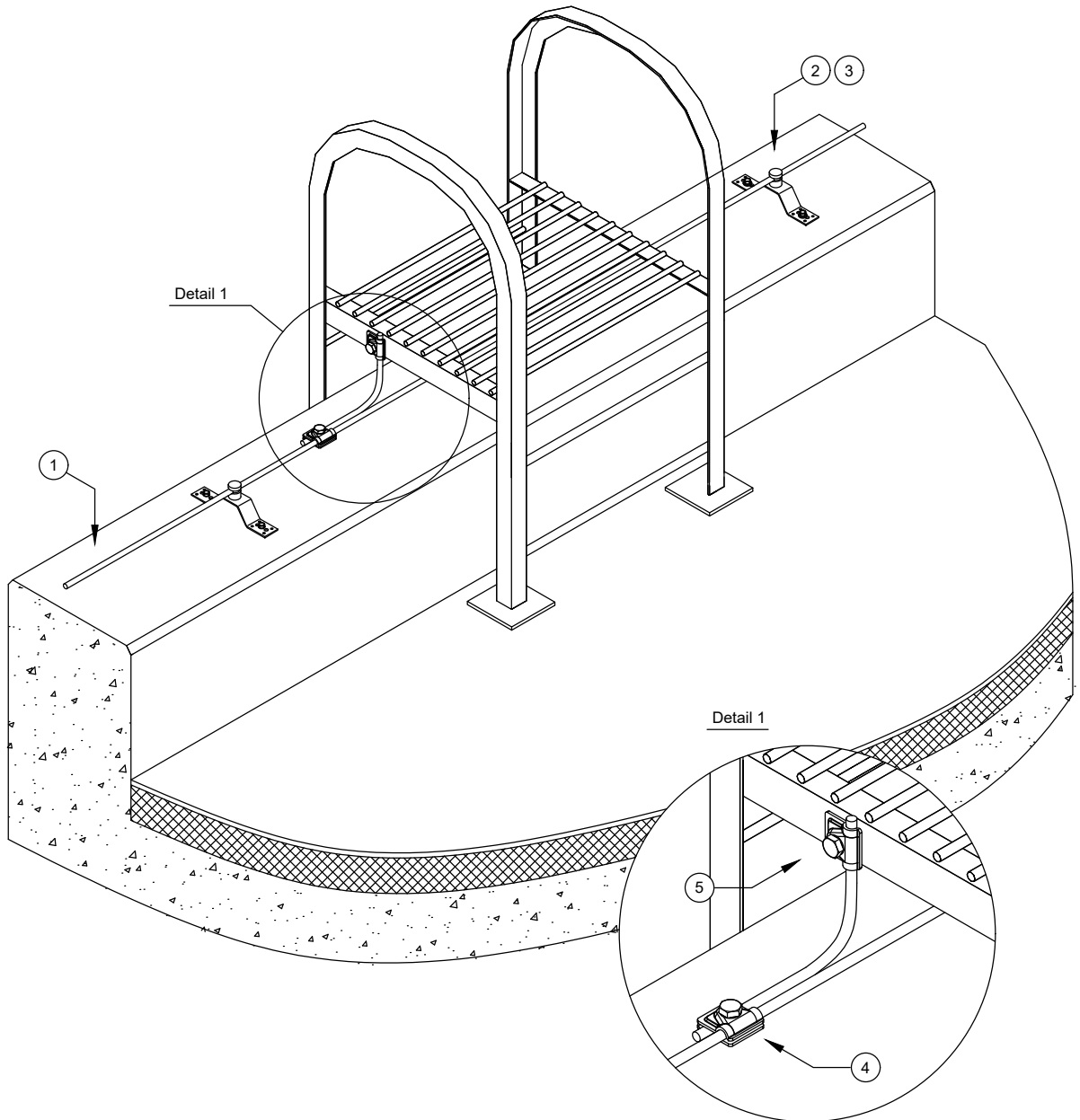
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5320712	288 DIN	Connection and bridging component	
4	5304176	5001 N-VA	Connector, Rd 8-10 mm with pressure trough	
5	5311519	249 8-10 ALU	Vario quick connector	
6	5311101	245 8-10 FT	T connector Rd 8-10 mm	

Drawing-No.:		PE 02	PF 250	Typical-No.:	OBO-TBS-250-T1.14	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs				
Creator:		Comment: Connecting of the lightning protection grid on a parapet wall.				
Editor:						
Status:						
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Ind.	Amendment typical	Date:	Name:			Sheet:
						of:

# 1 External lightning protection systems for flat roofs

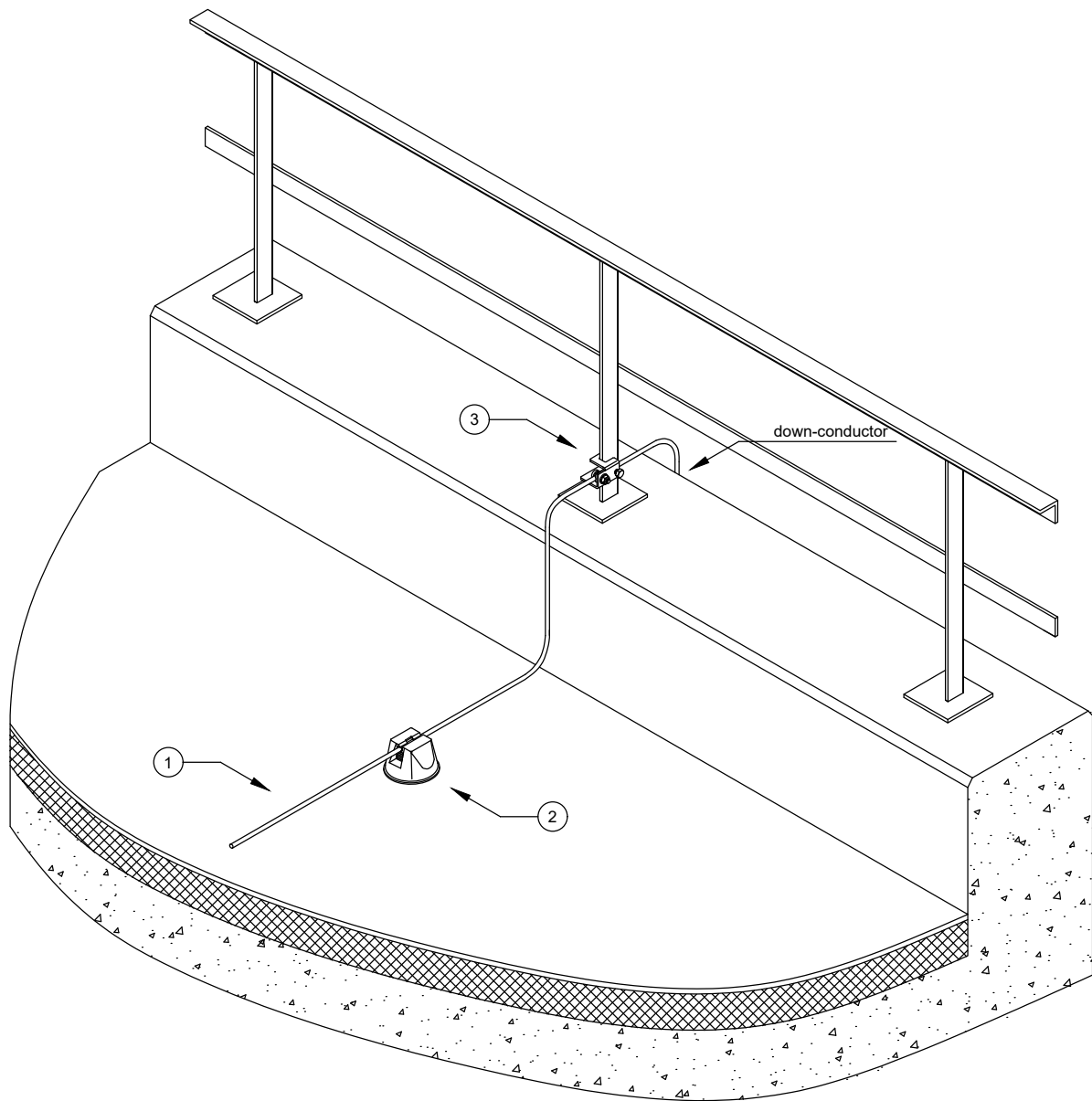


	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5320712	288 DIN	Connection and bridging component	
3	5304176	5001 N-VA	Connector, Rd 8-10 mm with pressure trough	
4	5311519	249 8-10 ALU	Vario quick connector	
5	5311585	249 8-10 ALU-OT	Connection terminal, equipotential bonding, Rd 8-10 mm	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.15	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roofs			
Editor:		Comment:			
Status:		Connecting a fire ladder to the lightning protection grid.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
					Sheet: of:



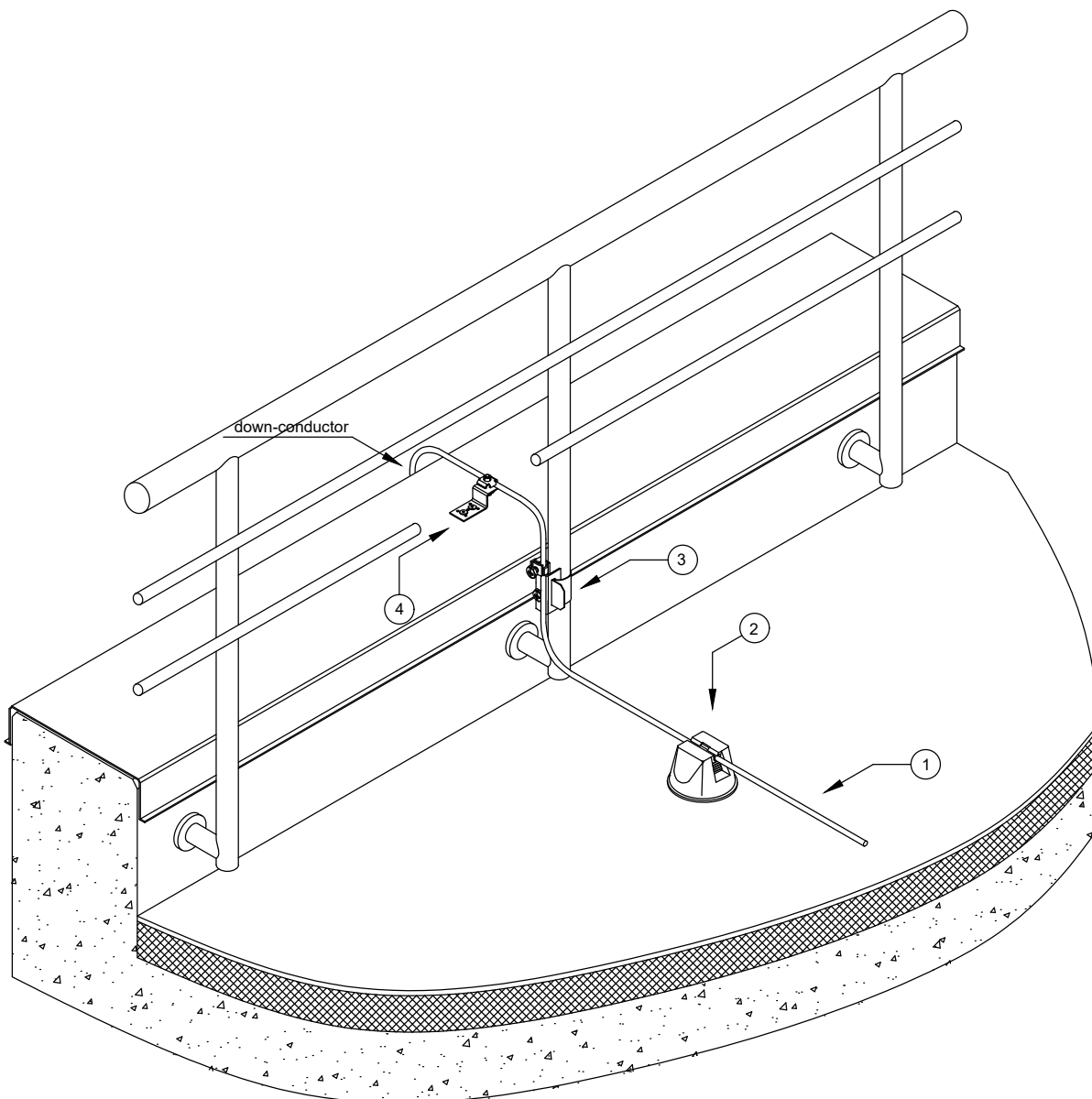
# 1 External lightning protection systems for flat roofs



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5218977	165 KRB SO	Roof conductor holder for flat roofs	
3	5304520	5010 20 FT	Construction clamp to 20 mm	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.16	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs			
Creator:		Comment: Connection of the metal handrail to the lightning protection grid.			
Editor:					
Status:					
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	— — —			<b>BETTERMANN</b>	Sheet:
Ind.	Amendment typical	Date:	Name:		of:

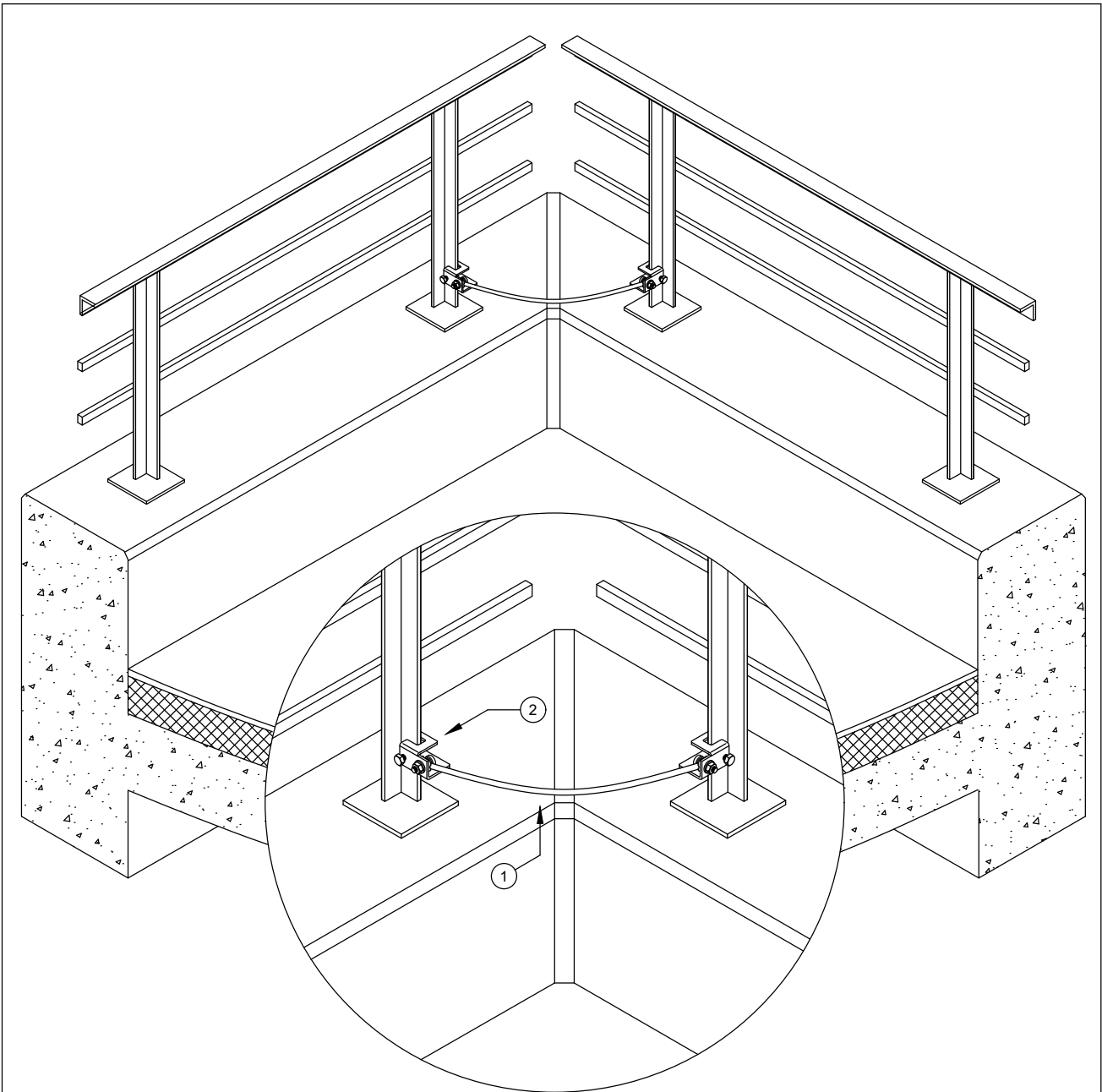
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5320712	288 DIN	Connection and bridging component	
3	5057515	927 1	Earthing pipe clamp VA	
4	5320707	287 DCT	Connection component with double crossbar	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.17	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs			
Creator:		Comment: Connection of the metal handrail to the lightning protection grid.			
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		Sheet: of:

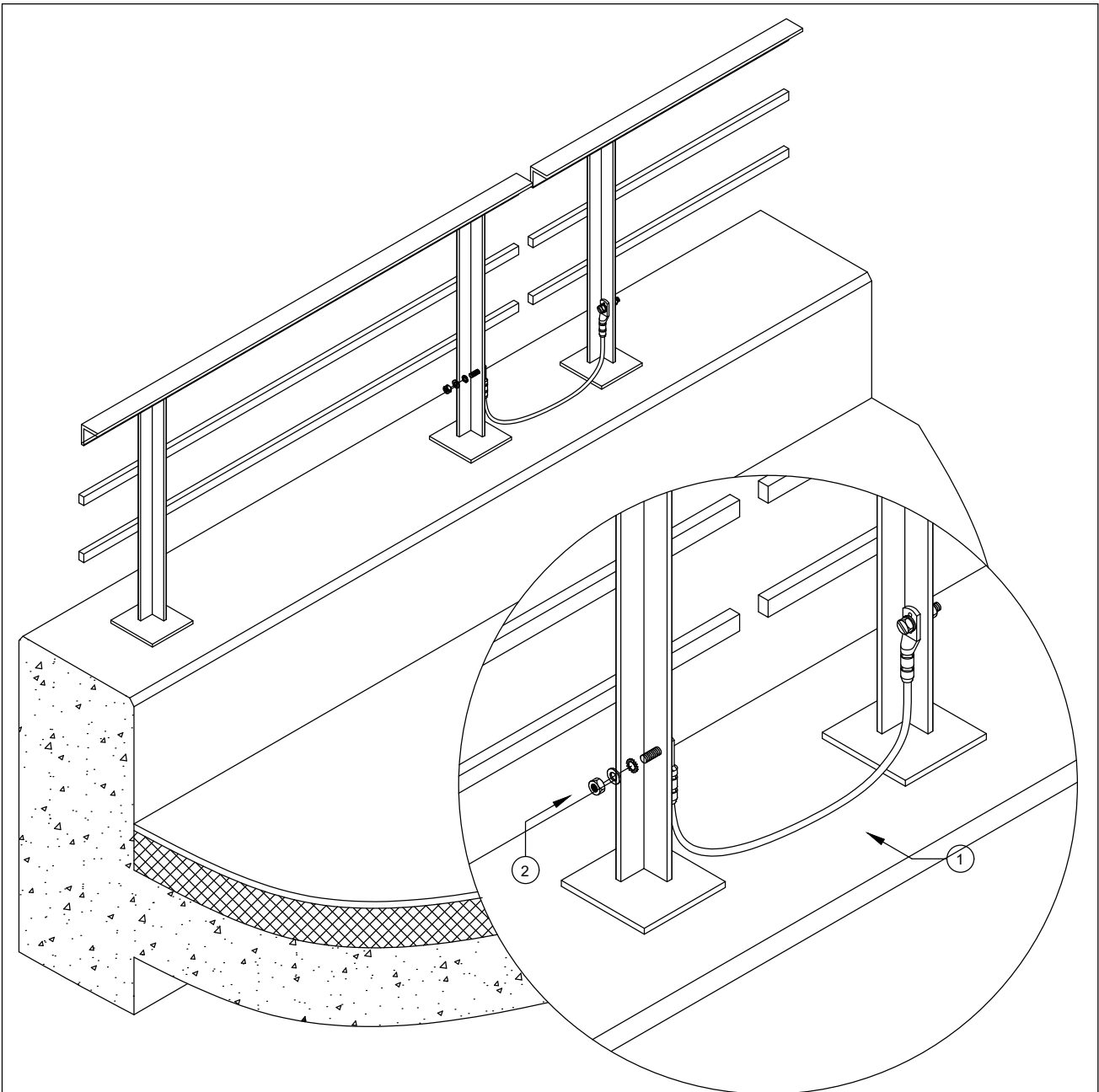
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5304520	5010 20 FT	Construction clamp to 20 mm	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.18	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs  Comment: Connection of the metal handrail to each other			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale:
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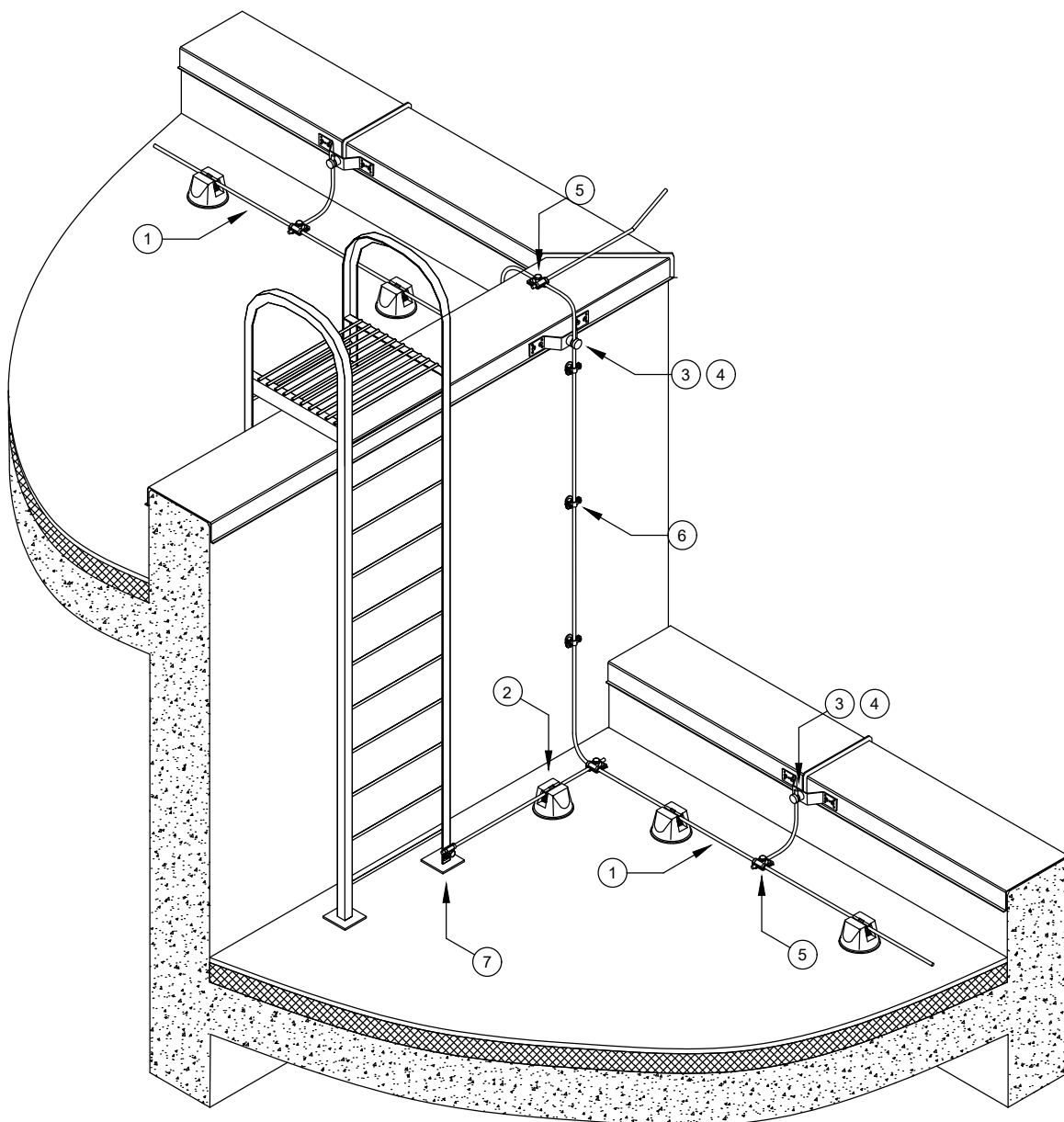
# 1 External lightning protection systems for flat roofs




	Item No.	Designation	Description	Q-ty
	1	5331013	853 300	Bridging cable
	2	3160734	SKS 10x25 F	Hexagonal bolt with nut and washer M10

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.19	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for flat roofs		
Editor:			Comment: Connection of the metal handrail to each other		
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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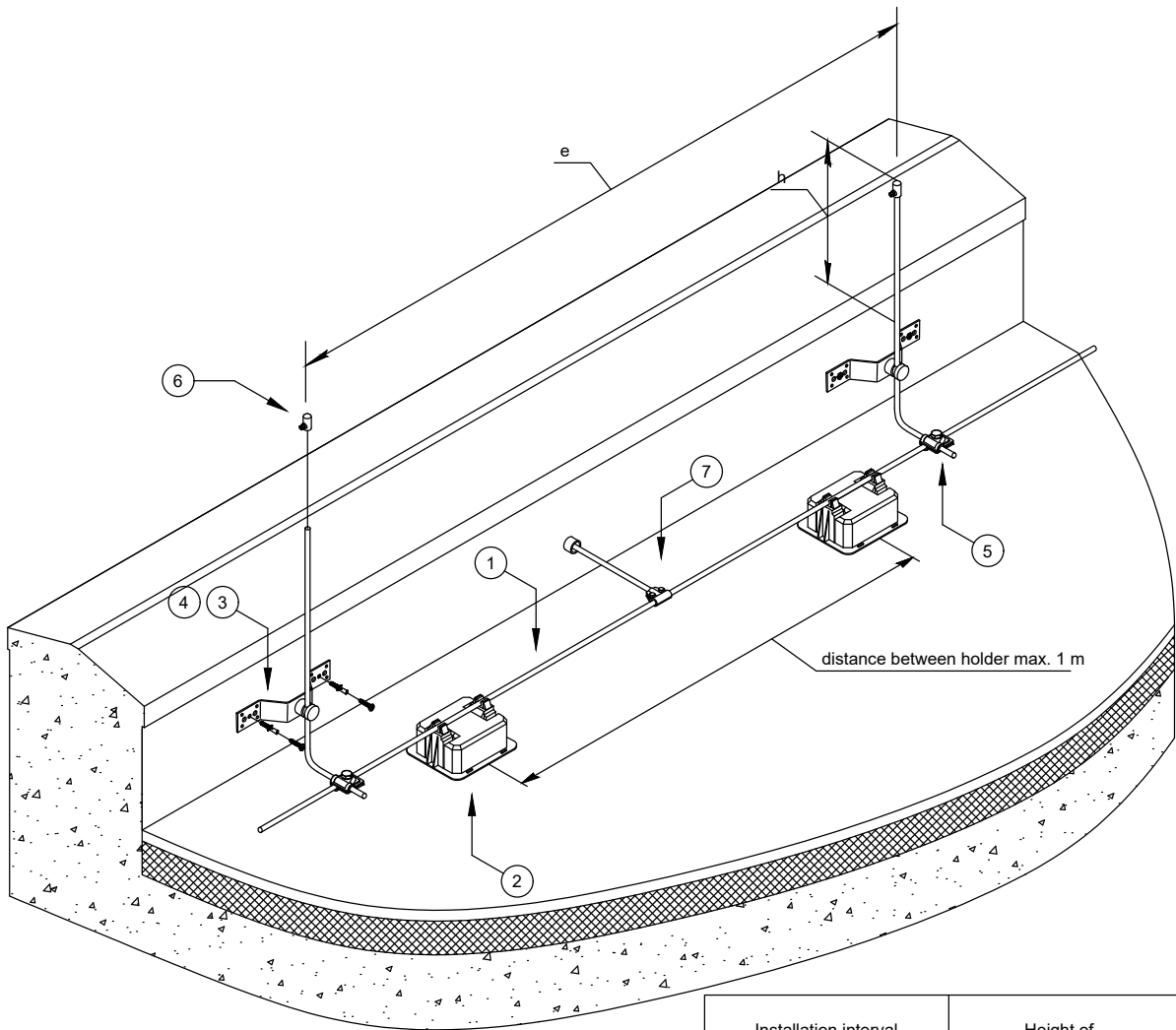
# 1 External lightning protection systems for flat roofs



	Item No.	Designation	Description	Q-ty	
	1	5021294	RD 8-ALU-T	Round conductor, aluminium	
	2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
	3	5320712	288 DIN	Connection and bridging component	
	4	5304176	5001 N-VA	Connector, Rd 8-10 mm with pressure trough	
	5	5311519	249 8-10 ALU	Vario quick connector	
	6	5230322	113 B-Z-HD	Cable bracket with crossbar, wood screw, plastic anchor	
	7	5311585	249 8-10 ALU-OT	Connection terminal, equipotential bonding, Rd 8-10 mm	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.20	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roofs			
Editor:		Comment:			
Status:		Fixing a round conductor to a metal roof parapet. Protection of corners and edges of the building.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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# 1 External lightning protection systems for flat roofs



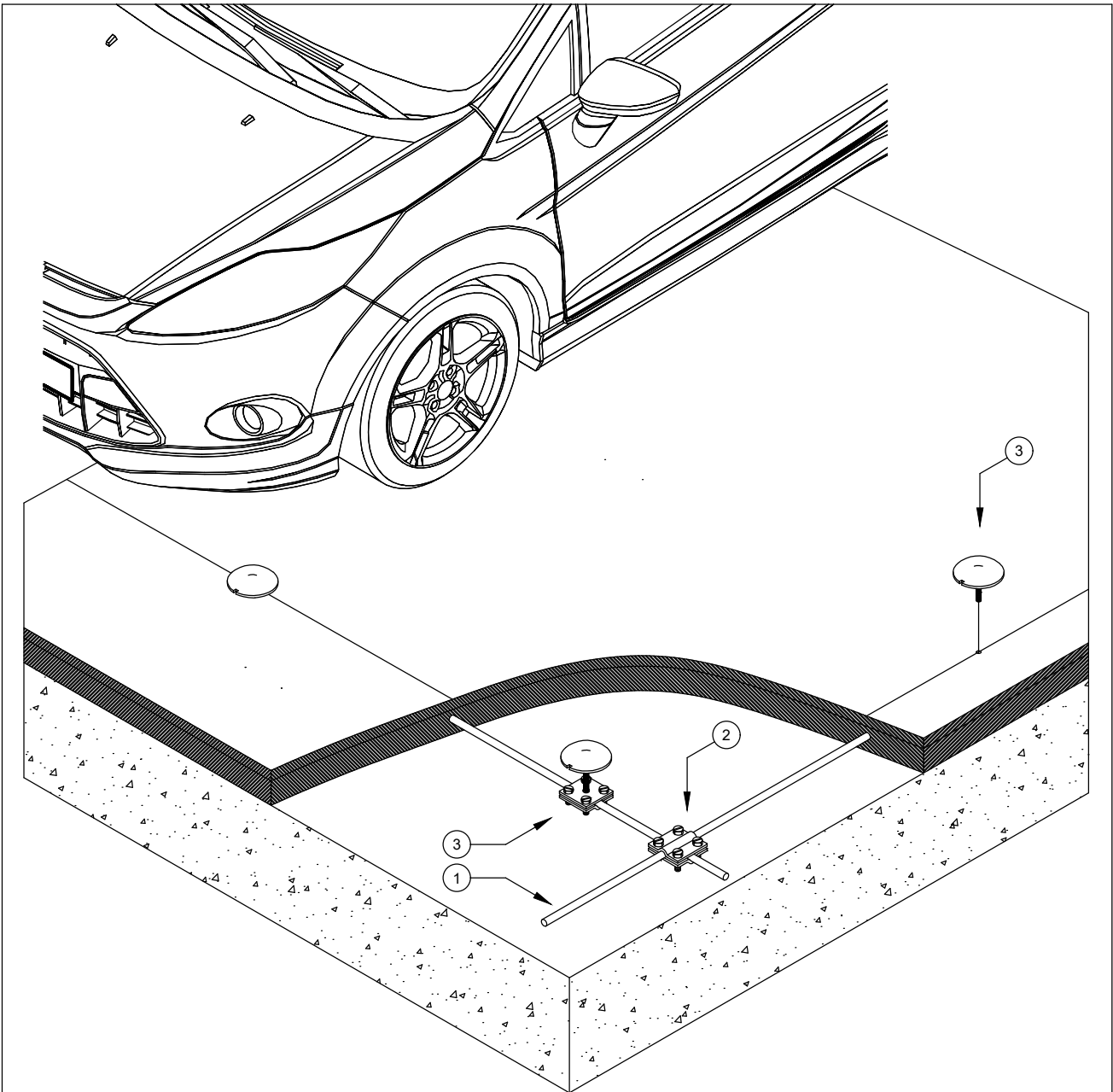
Installation interval of interception tip, e	Height of interception tip, h
3 m	0,15 m
4 m	0,25 m
5 m	0,35 m
6 m	0,45 m

	Item No.	Designation	Description	Q-ty
	1	5021050 RD 8-FT 50	Round conductor, galvanised steel	
	2	5218997 165 R-8-10	Roof conductor holder for flat roofs	
	3	5320712 288 DIN	Connection and bridging component	
	4	5304176 5001 N-VA	Connector, Rd 8-10 mm with pressure trough	
	5	5311500 249 8-10 ST	Vario quick connector	
	6	5405068 120 A	Air-termination tip	
	7	5311101 245 8-10 FT	T connector Rd 8-10 mm	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.21	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for flat roofs		
Editor:			Comment: Protection of the flat parapet of the building by means of interception tips.		
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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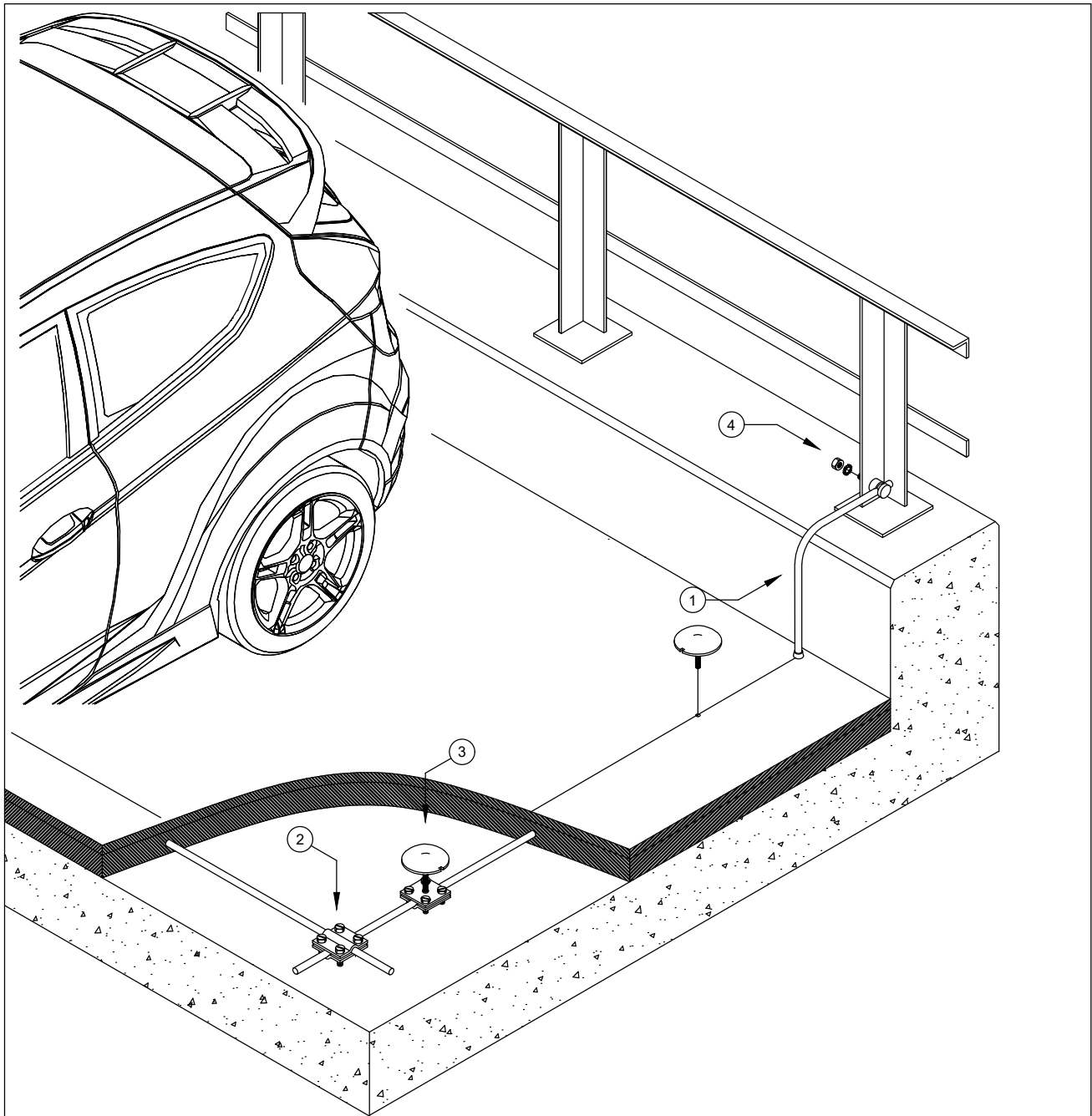
**1 External lightning protection systems for flat roofs**




	Item No.	Designation	Description	Q-ty
1	5021647	RD 10 - V4A	Round conductor, stainless steel	
2	5312318	252 8-10 V4A	Cross-connector	
3	5405769	128 F	Mushroom-shaped air -termination with connectors	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.22	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for flat roofs		
Editor:			Comment: Lightning protection of the parking lot on the roof of the building. Laying conductors in a waterproofing coating		
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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# 1 External lightning protection systems for flat roofs

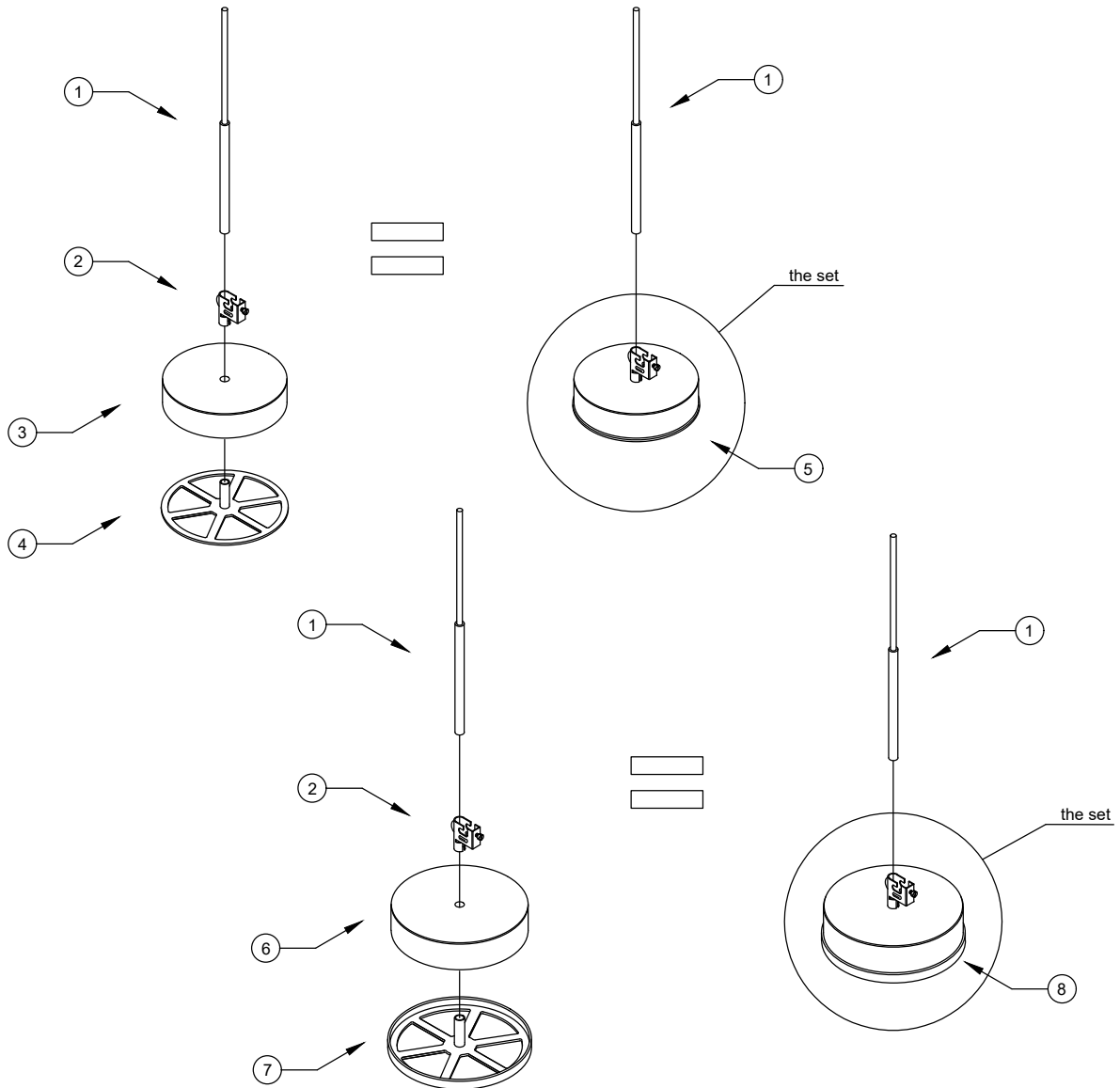


	Item No.	Designation	Description	Q-ty
1	5021647	RD 10 - V4A	Round conductor, stainless steel	
2	5312318	252 8-10 V4A	Cross-connector	
3	5405769	128 F	Mushroom-shaped air -termination with connectors	
4	5304176	5001 N-VA	Connector, Rd 8-10 mm with pressure trough	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T1.23	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roofs  Comment: Lightning protection of the parking lot on the roof of the building. Laying conductors in a waterproofing coating			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
					Sheet: of:



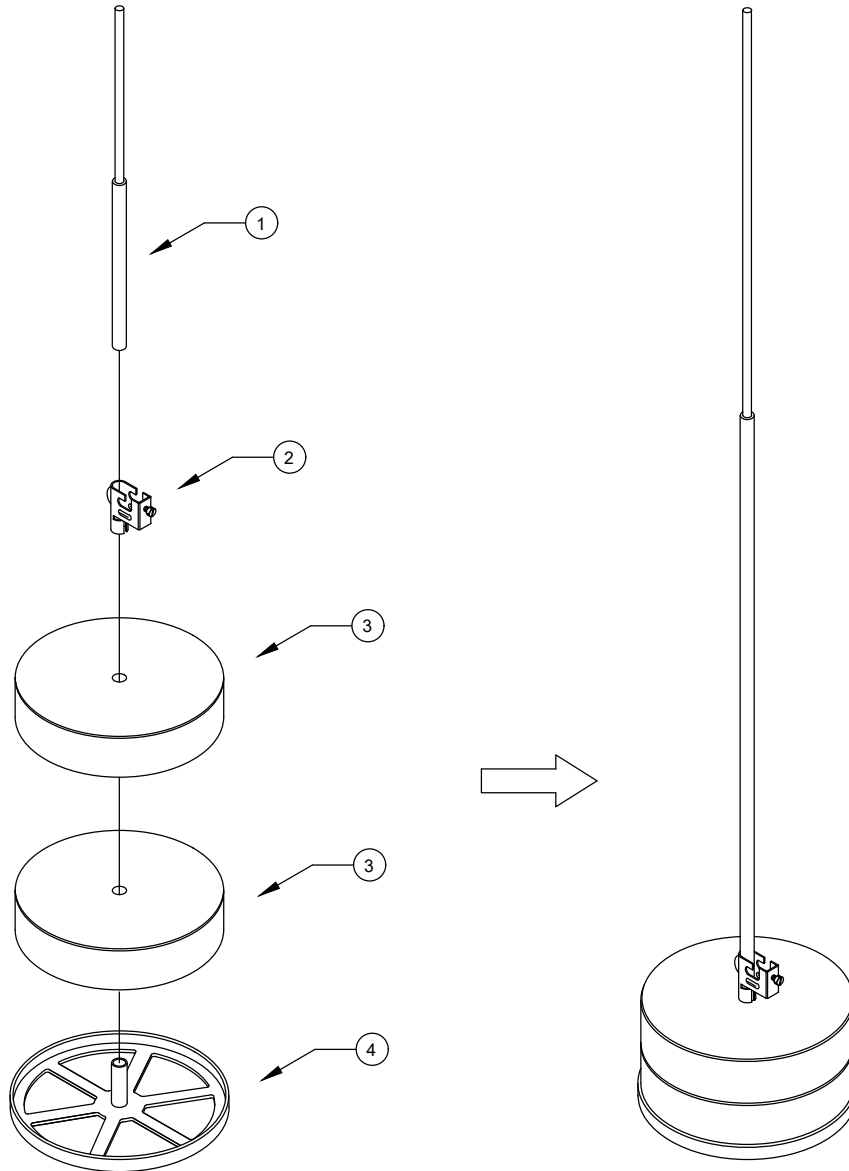
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty
1	5401980	101 VL1500	Tapered pipe air termination rod	
2	5403219	F-FIX-KL	Terminal for FangFix system	
3	5403117	F-FIX-S10	Concrete block for FangFix system 10 kg	
4	5403124	F-FIX-B10	Base for FangFix system 10 kg	
5	5403103	F-FIX-10	Stand for FangFix system 10 kg	
6	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg	
7	5403225	F-FIX-B16	Base for FangFix system 16 kg	
8	5403200	F-FIX-16	Stand for FangFix system 16 kg	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.01	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment			
Creator:		Comment: Assembly of the FangFix lightning system.			
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:
				<b>BETTERMANN</b>	

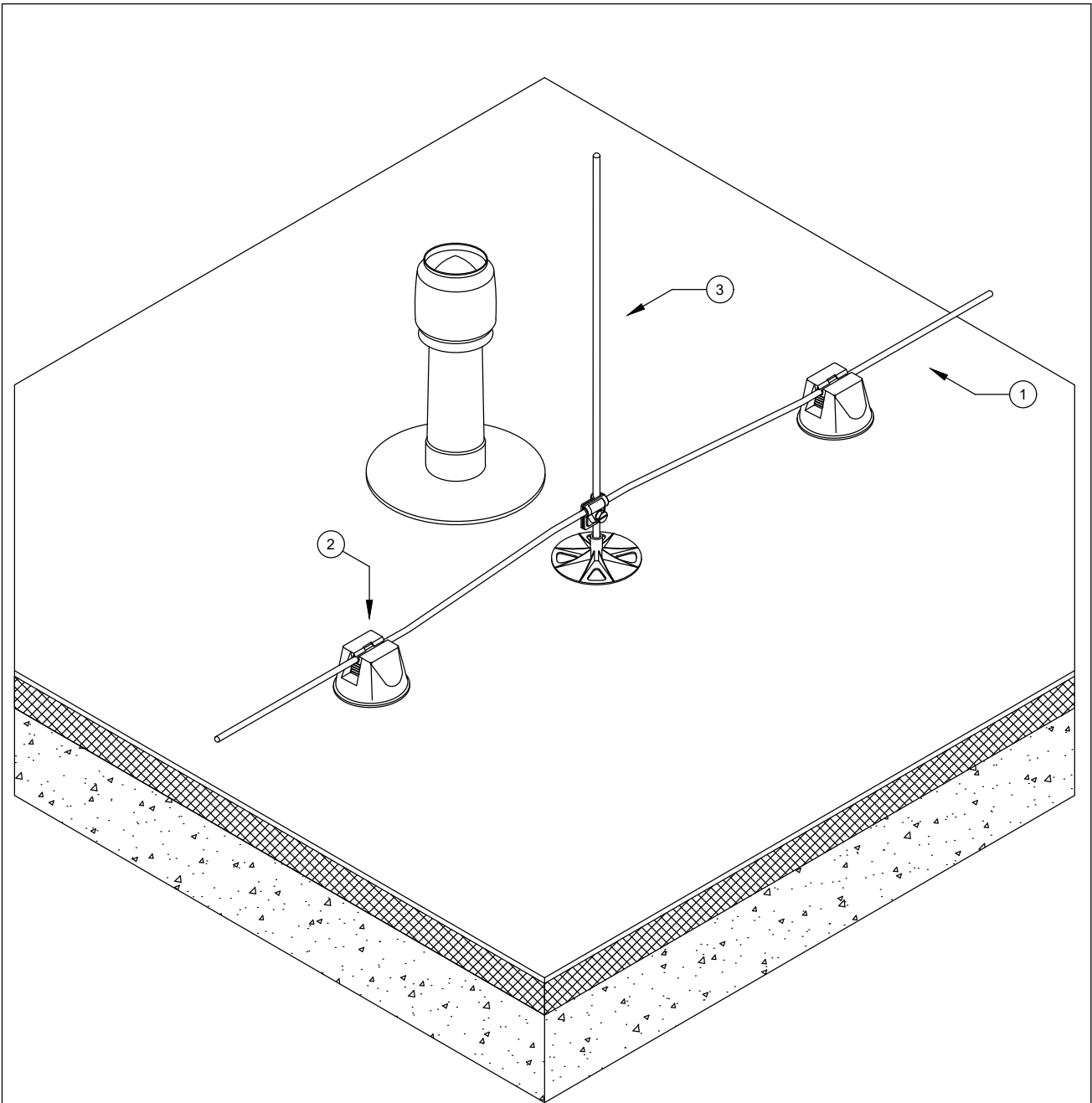
## 2 External lightning protection systems for flat roof equipment





	Item No.	Designation	Description	Q-ty
1	5401983	101 VL2000	Tapered pipe air-termination rod	
2	5403219	F-FIX-KL	Terminal for FangFix system	
3	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg	
4	5403225	F-FIX-B16	Base for FangFix system 16 kg	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.02	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Installation of additional FangFix system supports depending on the wind load.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:	 BETTERMANN	Scale: Sheet: of:

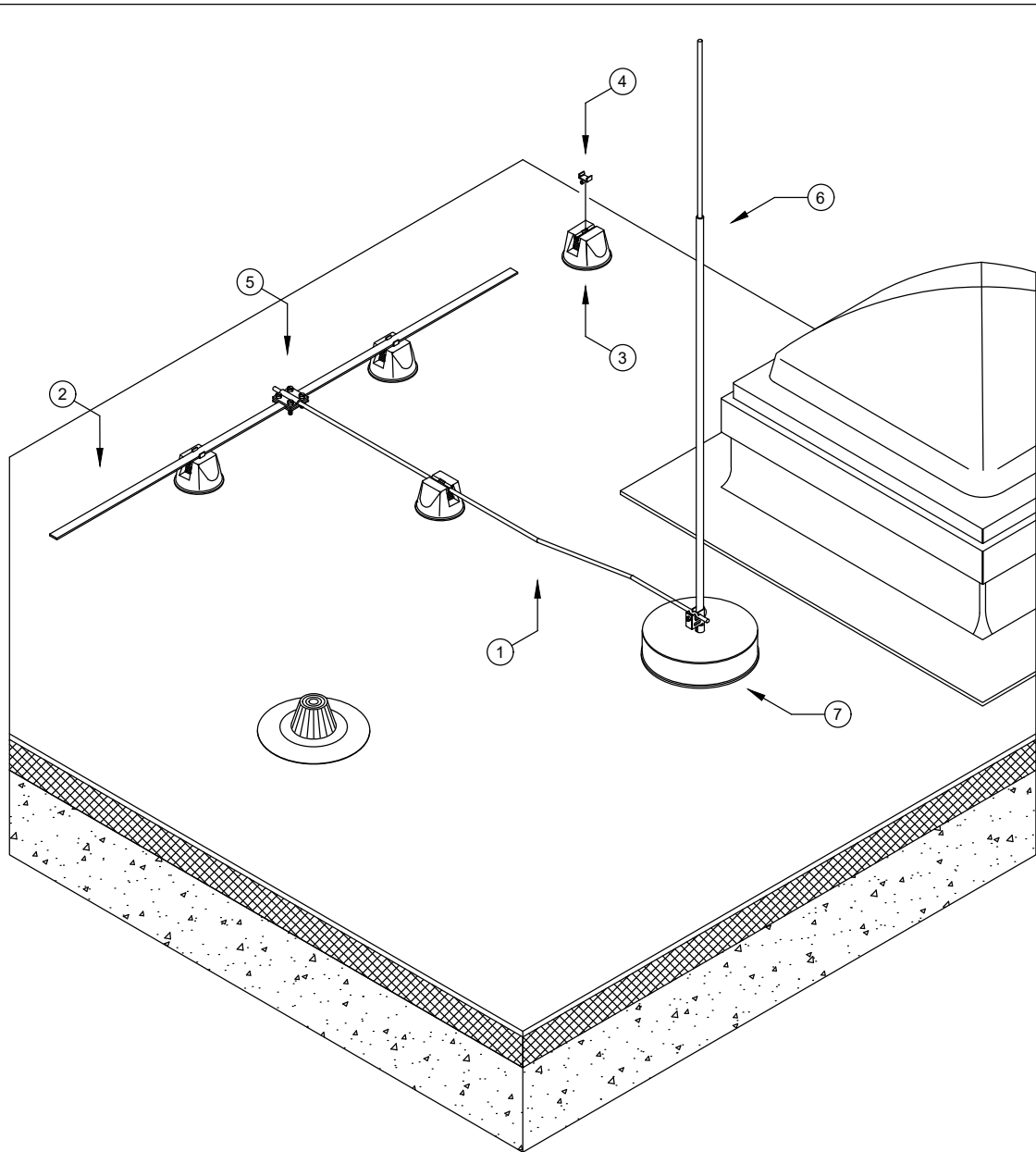
## 2 External lightning protection systems for flat roof equipment



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5403308	F-FIX-JUNIOR	Stand for FangFix Junior system	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.03	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Lightning protection of the roof aerator. Installation of an interception rod.			
Creator:					
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		

## 2 External lightning protection systems for flat roof equipment

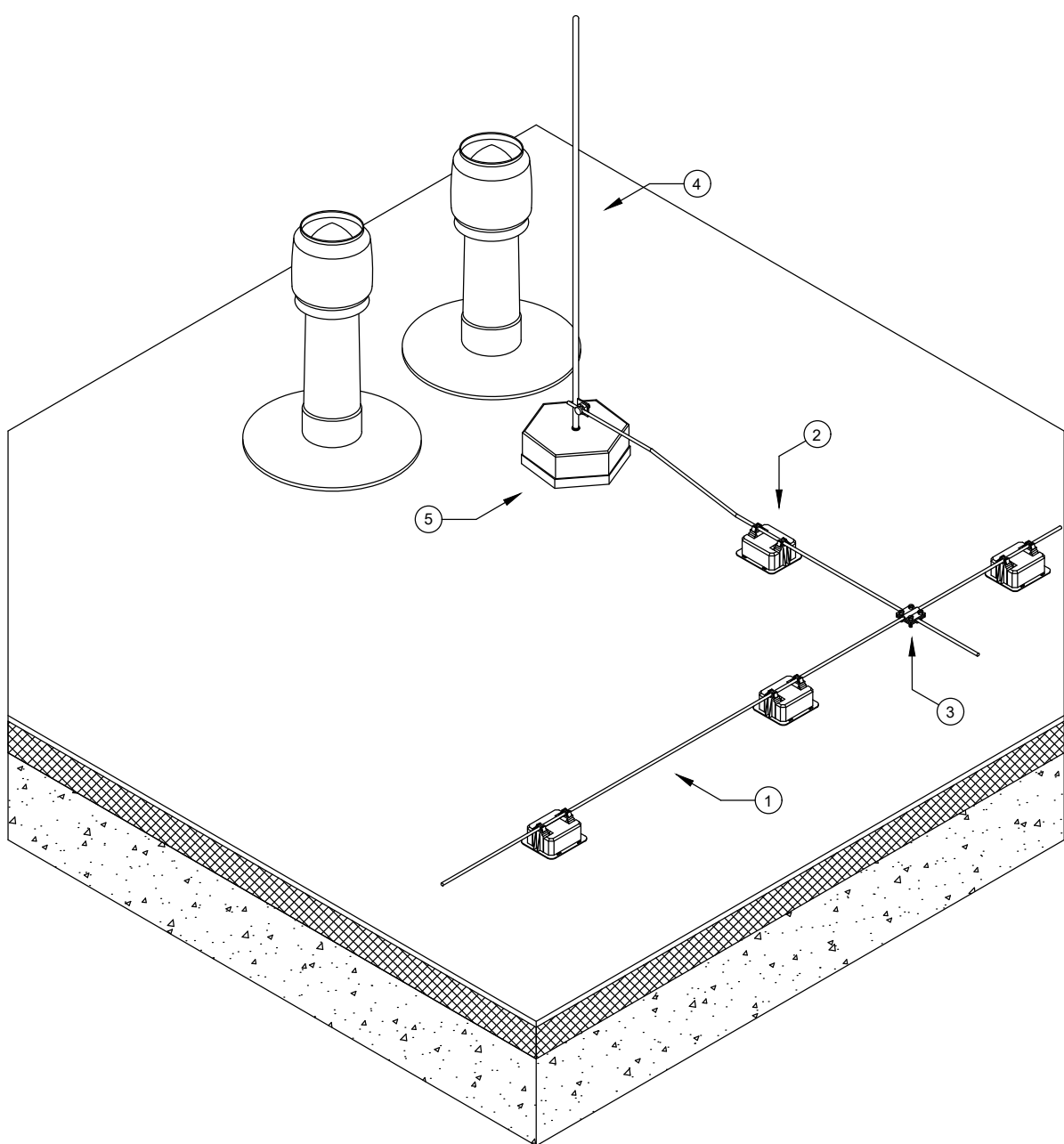


	Item No.	Designation	Description	Q-ty
	1	5021294 RD 8-ALU T	Round conductor, aluminium	
	2	5019347 5052 DIN 30x3,5	Flat conductor, galvanised steel	
	3	5218700 165 MBG-8-10	Roof conductor holder for flat roofs	
	4	5218885 165 MBG HFL	Flat conductor adapter for roof conductor holder	
	5	5312655 252 8-10xFL30FT	Cross-connector for round and flat conductors	
	6	5401983 101 VL2000	Tapered pipe air-termination rod	
	7	5403200 F-FIX-16	Stand for FangFix system 16 kg	



Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.04	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment			
Creator:		Comment: Lightning protection for a skylight. Installation of an interception rod.			
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Ind.	Amendment typical	Date:	Name:		



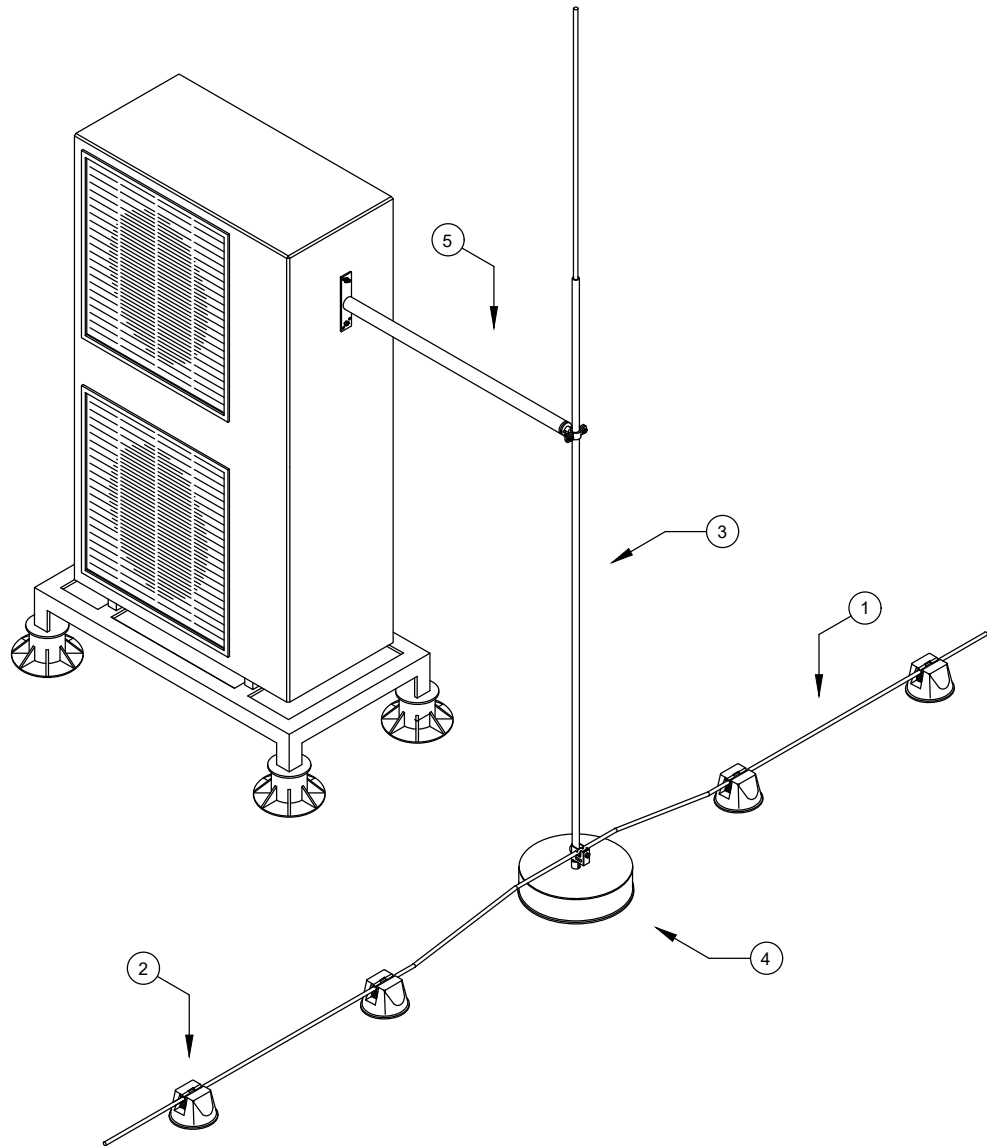
## 2 External lightning protection systems for flat roof equipment





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218997	165 R-8-10	Roof conductor holder for flat roofs	
3	5312604	253 8x8	Cross-connector Rd 8-10 mm	
4	5402859	101 A-L150	Air-termination rod, one end rounded with connection strap	
5	5402891	101 ST	Stand 6,9 kg with female thread	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.05	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment			
Creator:		Comment: Lightning protection of several roof aerators. Installation of an interception rod.			
Editor:					
Status:					
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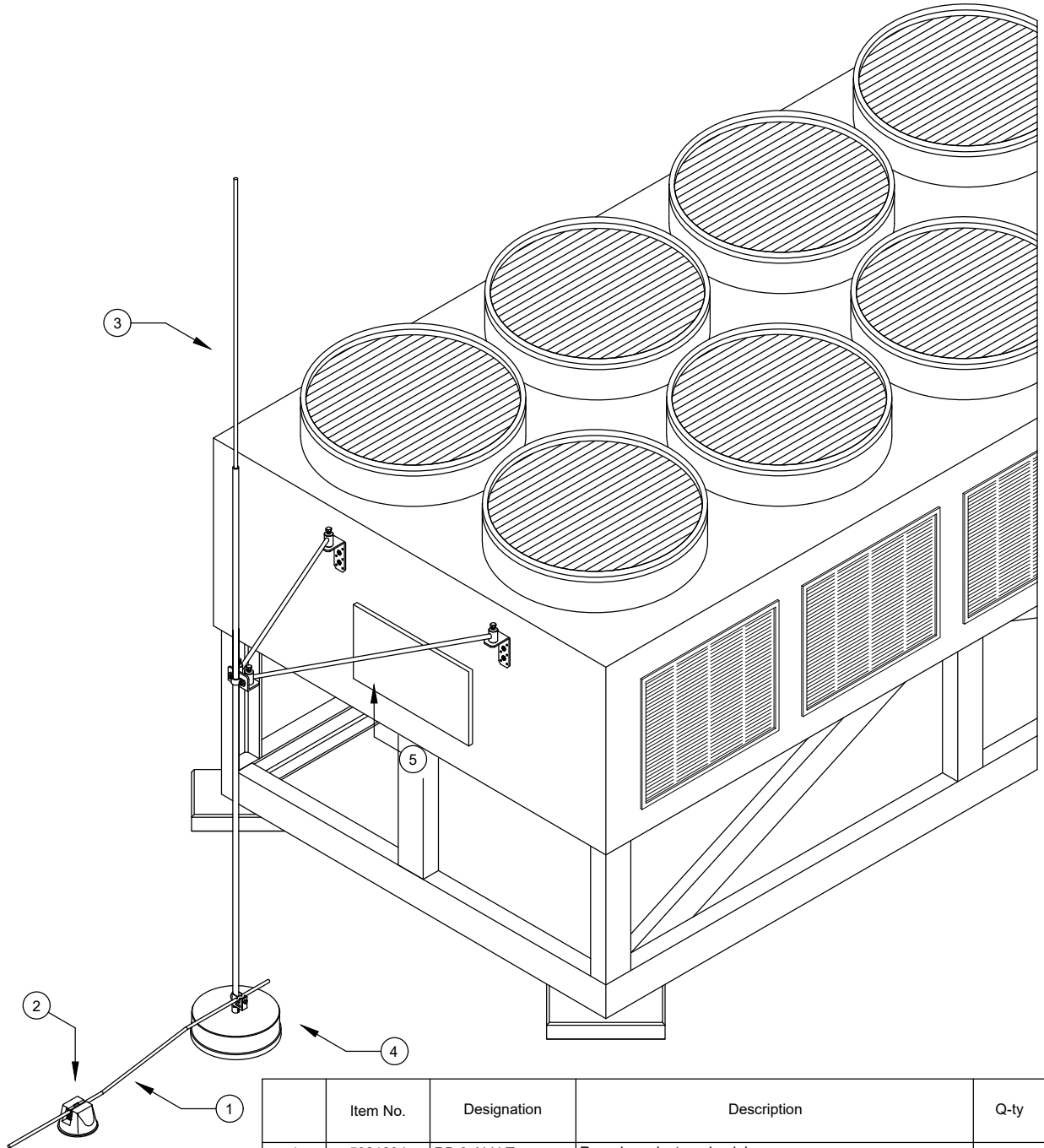
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5401989	101 VL3000	Tapered pipe air-termination rod	
4	5403200	F-FIX-16	Stand for FangFix system 16 kg	
5	5408806	ISO-A-500	Insulated spacer	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.06	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Lightning protection of outdoor unit the air-condition. Installation of an interception rod with an insulated spacer.			
Creator:					
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		

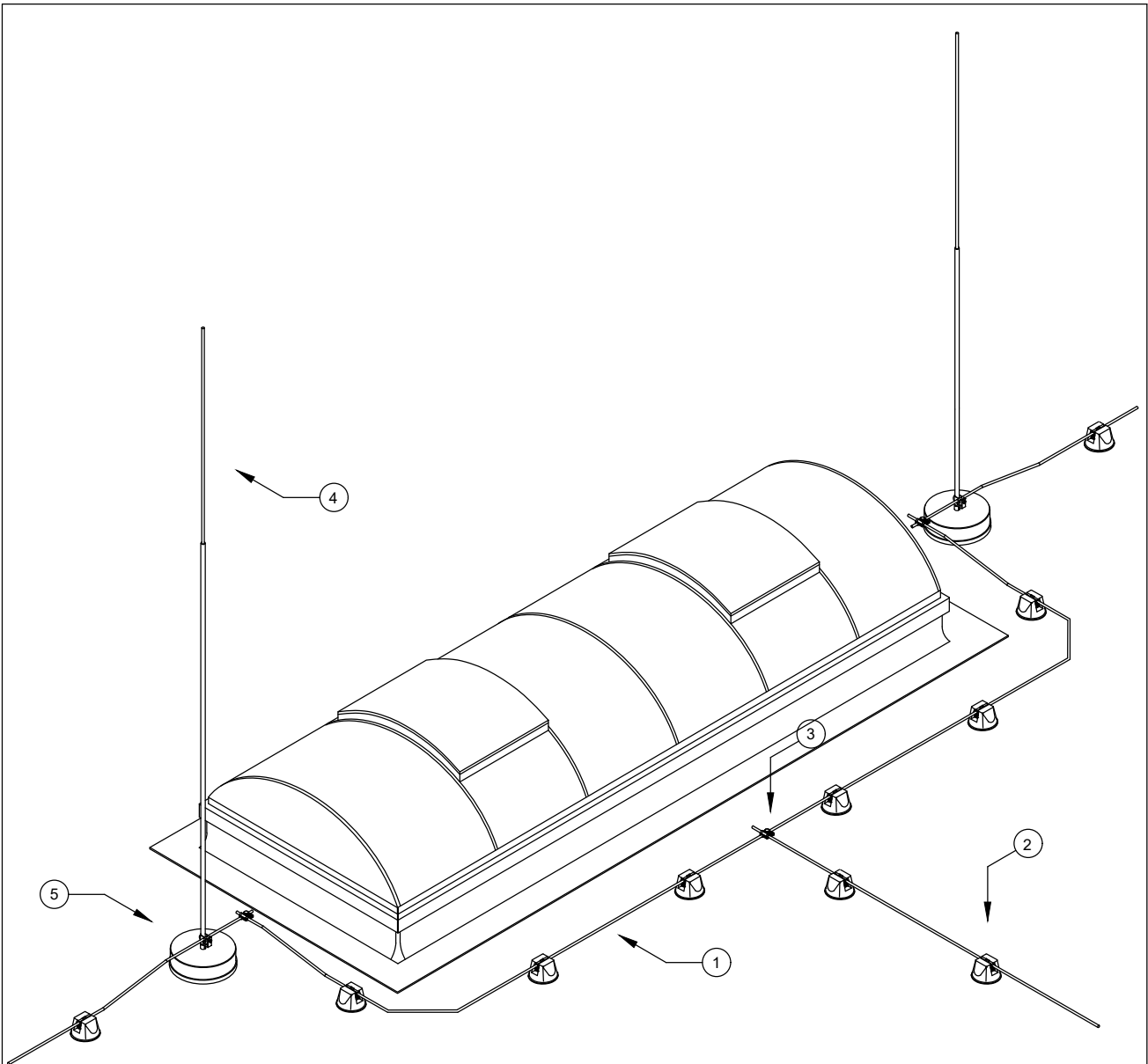
## 2 External lightning protection systems for flat roof equipment





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5401995	101 VL4000	Tapered pipe air-termination rod	
4	5403200	F-FIX-16	Stand for FangFix system 16 kg	
5	5408978	101 VS-16	Insulated lightning protection set, V fastening	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.07	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment			
Creator:		Comment: Lightning protection of chiller system. Installation of an interception rod with a V-fastening spacer.			
Editor:					
Status:					
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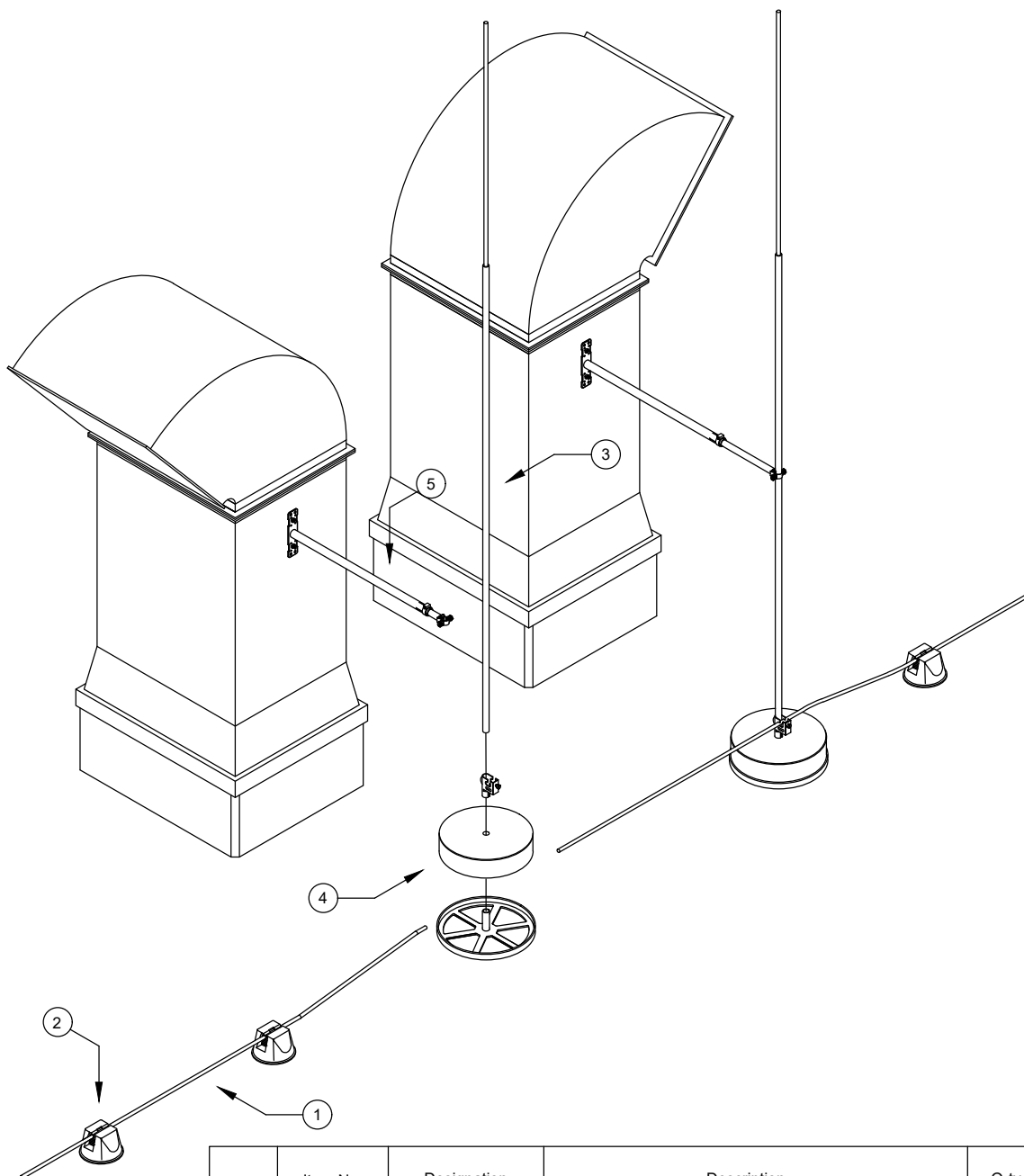
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5311519	249 8-10 ALU	Vario quick connector	
4	5401983	101 VL2000	Tapered pipe air-termination rod	
5	5403200	F-FIX-16	Stand for FangFix system 16 kg	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.08	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Lightning protection of a flat roof light dome. Installation of several interception rods.			
Creator:					
Editor:					
Status:					
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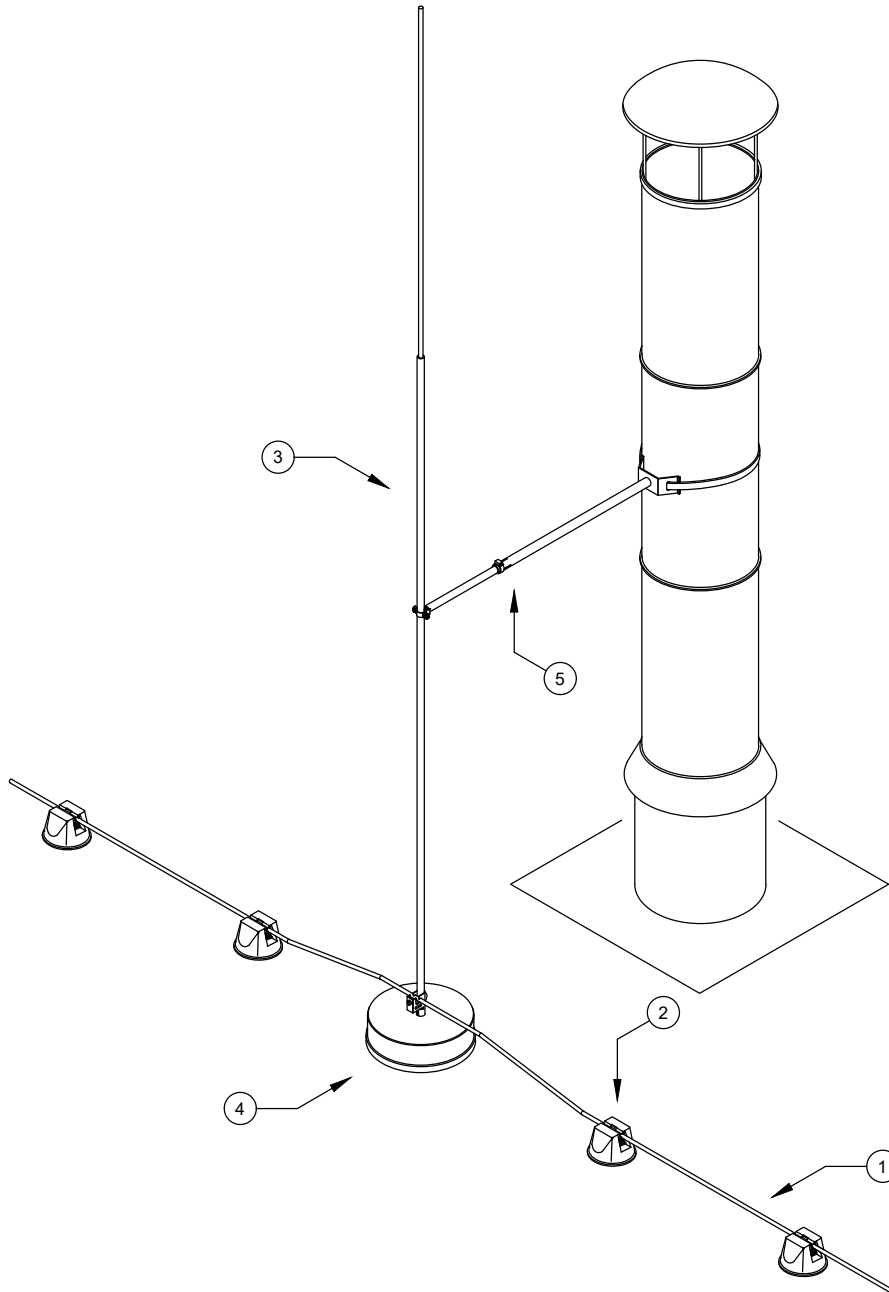
## 2 External lightning protection systems for flat roof equipment





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5401989	101 VL3000	Tapered pipe air-termination rod	
4	5403200	F-FIX-16	Stand for FangFix system 16 kg	
5	5408852	ISAV1000W	Adjustable insulating beam-wall	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.09	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roof equipment			
Editor:		Comment:			
Status:		Lightning protection of ventilation pipes. Installation of the interception rods with adjustable spacers.			
Ind.	Amendment typical	Date:	Name:		Scale:
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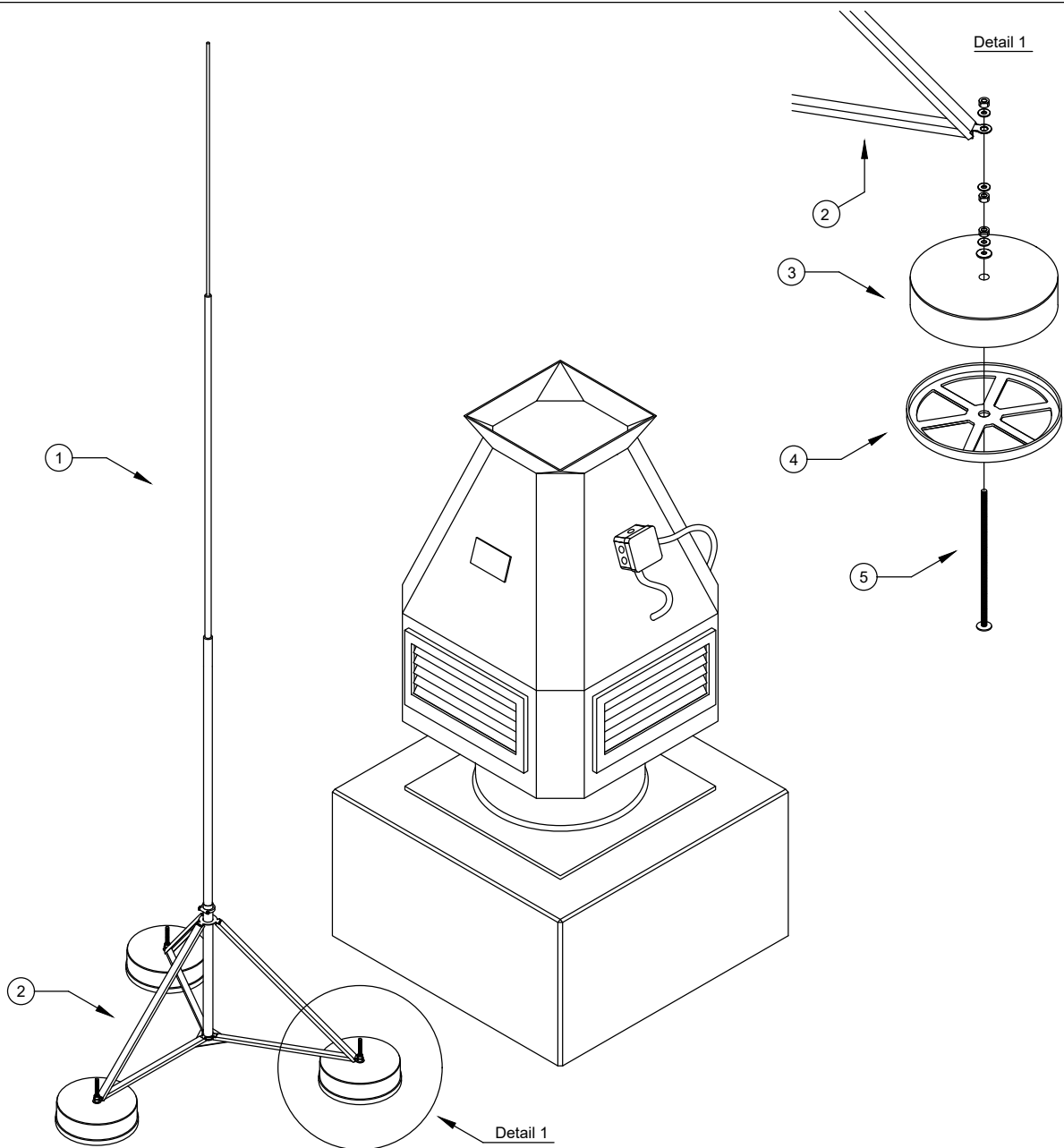
## 2 External lightning protection systems for flat roof equipment



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5401989	101 VL3000	Tapered pipe air-termination rod	
4	5403200	F-FIX-16	Stand for FangFix system 16 kg	
5	5408849	ISAV1000R	Adjustable insulating beam-wall	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.10	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Lightning protection of a chimney. Installation of an interception rod with adjustable spacer.		
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Status:					
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Ind.	Amendment typical	Date:	Name:		

## 2 External lightning protection systems for flat roof equipment

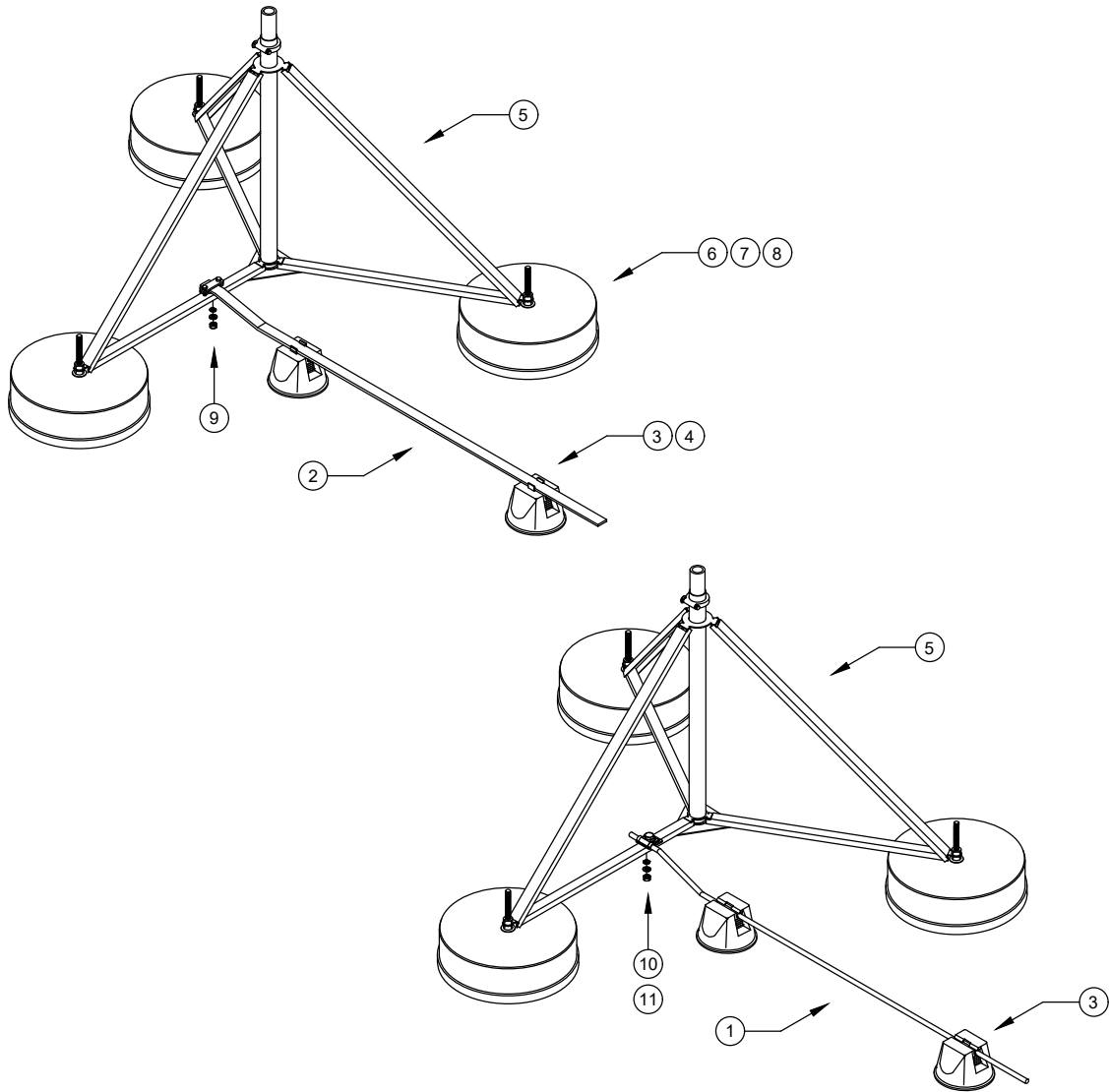


	Item No.	Designation	Description	Q-ty
1	5402868	101 3B-5000	isFang air-termination rod	
2	5408966	isFang 3B-100 AL	isFang air-termination rod stand	
3	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg	
4	5403238	F-FIX-B16 3B	Base for FangFix system	
5	5408971	isFang 3B-G1	isFang-3B threaded rod	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.11	Project No.:
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Editor:			Comment: Lightning protection of ventilation system. Installation of an interception rod on an interception rod stand.		
Status:					
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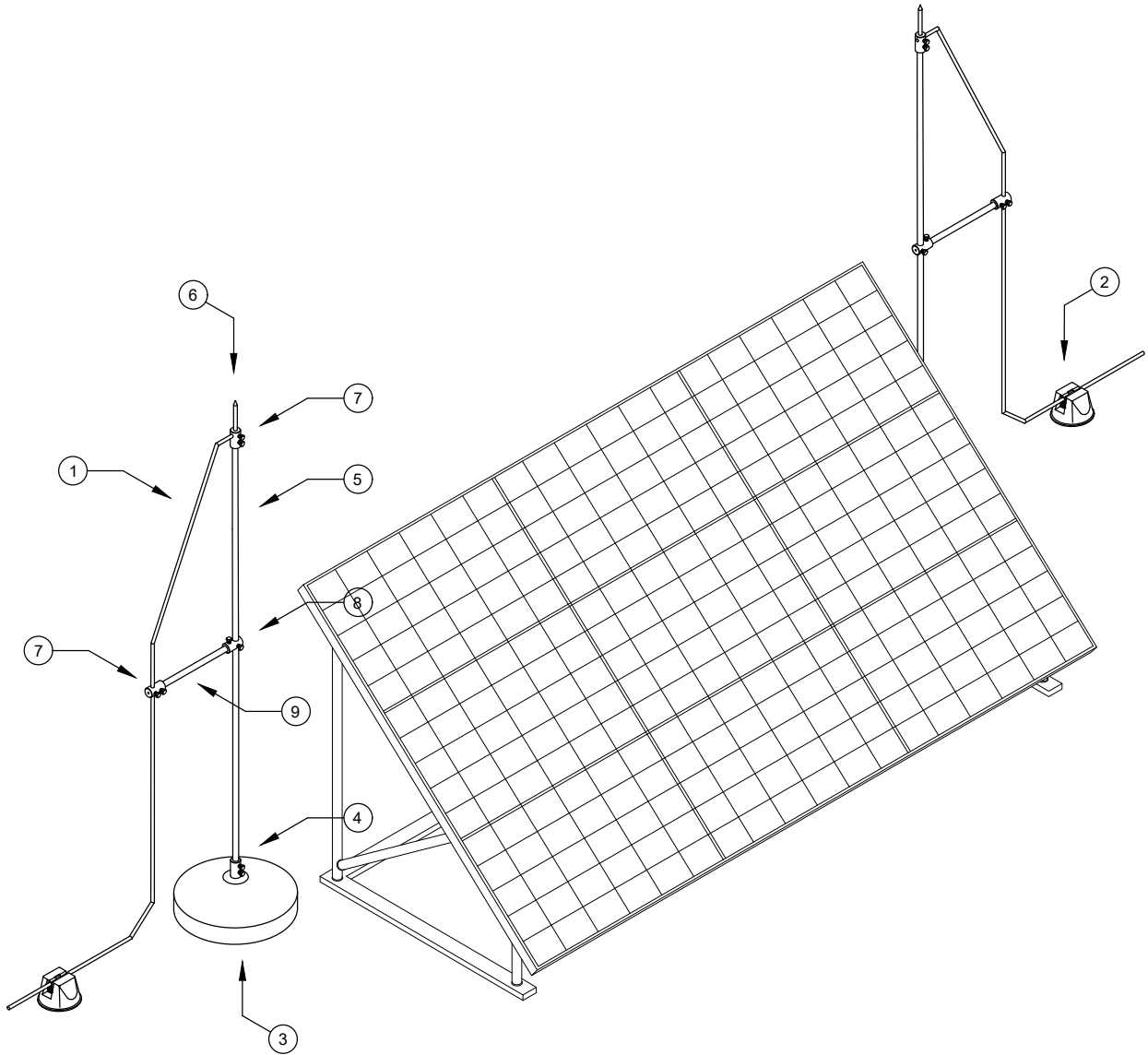
## 2 External lightning protection systems for flat roof equipment





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
3	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
4	5218885	165 MBG HFL	Flat conductor adapter for roof conductor holder	
5	5408966	isFang 3B-100 AL	isFang air-termination rod stand	
6	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg	
7	5403238	F-FIX-B16 3B	Base for FangFix system 16 kg	
8	5408971	isFang 3B-G1	isFang-3B threaded rod	
9	5313066	250 A-BO	Diagonal clamp with bolt	
10	5311585	249 8-10 ALU-OT	Connection terminal, equipotential bonding, Rd 8-10	
11	6408516	SKS 10x60 F	Hexagonal bolt with nut and washer M10	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.12	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roof equipment			
Editor:		Comment:			
Status:		Ways to connect isFang interception rod stand to various lightning conductors.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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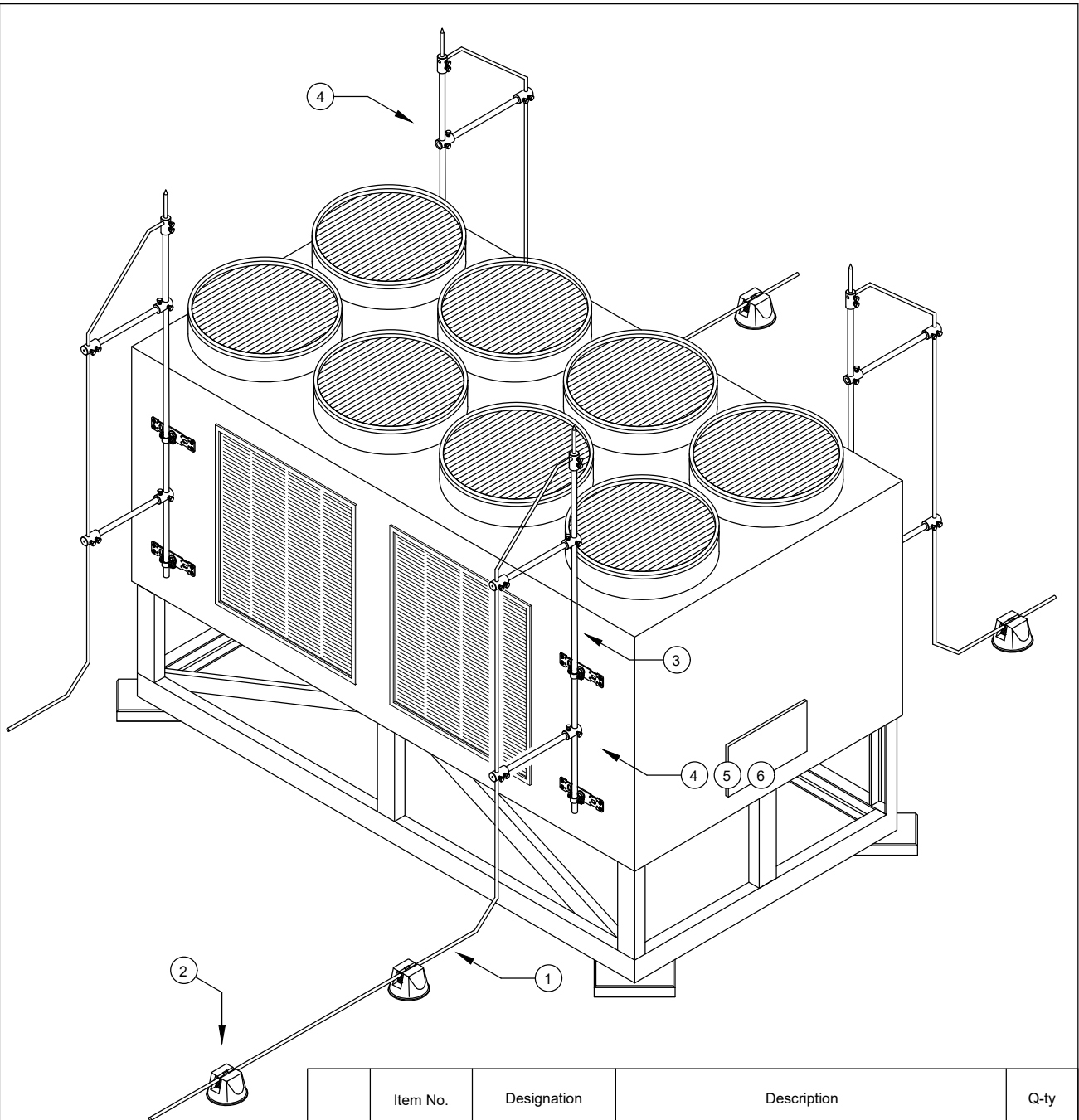
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty	
	1	5021294	RD 8-ALU T	Round conductor, aluminium	
	2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
	3	5402958	101 B2-16 M16	Stand 16 kg with female thread	
	4	5408350	101 A-M16	Connection piece	
	5	5408105	101 20-3000	Insulating rod	
	6	5408458	101 ISP M10	Air-termination tip	
	7	5408393	101 IES	End piece	
	8	5408156	101 IT	T connector	
	9	5408107	16-750	Insulating rod	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.13	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Lightning protection for photovoltaic system. Installation of an insulated protection system.			
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Status:					
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Ind.	Amendment typical	Date:	Name:		

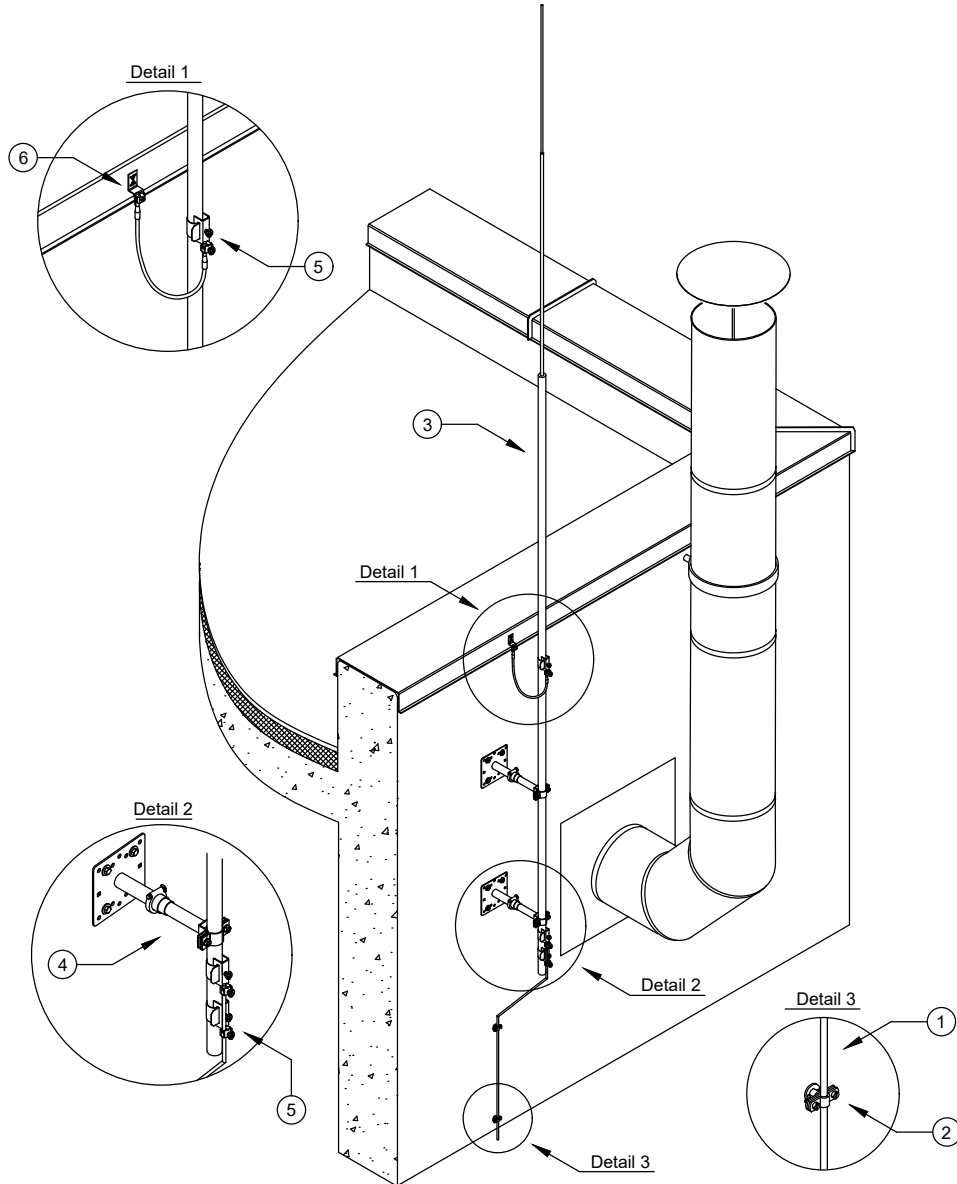
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5408976	101 3-ES-16	Insulated lightning protection set, 3-corner fastening	
4	5408158	101 IT-16	T connector	
5	5408107	101 16-750	Insulating rod	
6	5408395	101 IES-16	End piece	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.14	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roof equipment			
Editor:		Comment:			
Status:		Lightning protection of chiller system. Installation of the set of insulated lightning protection.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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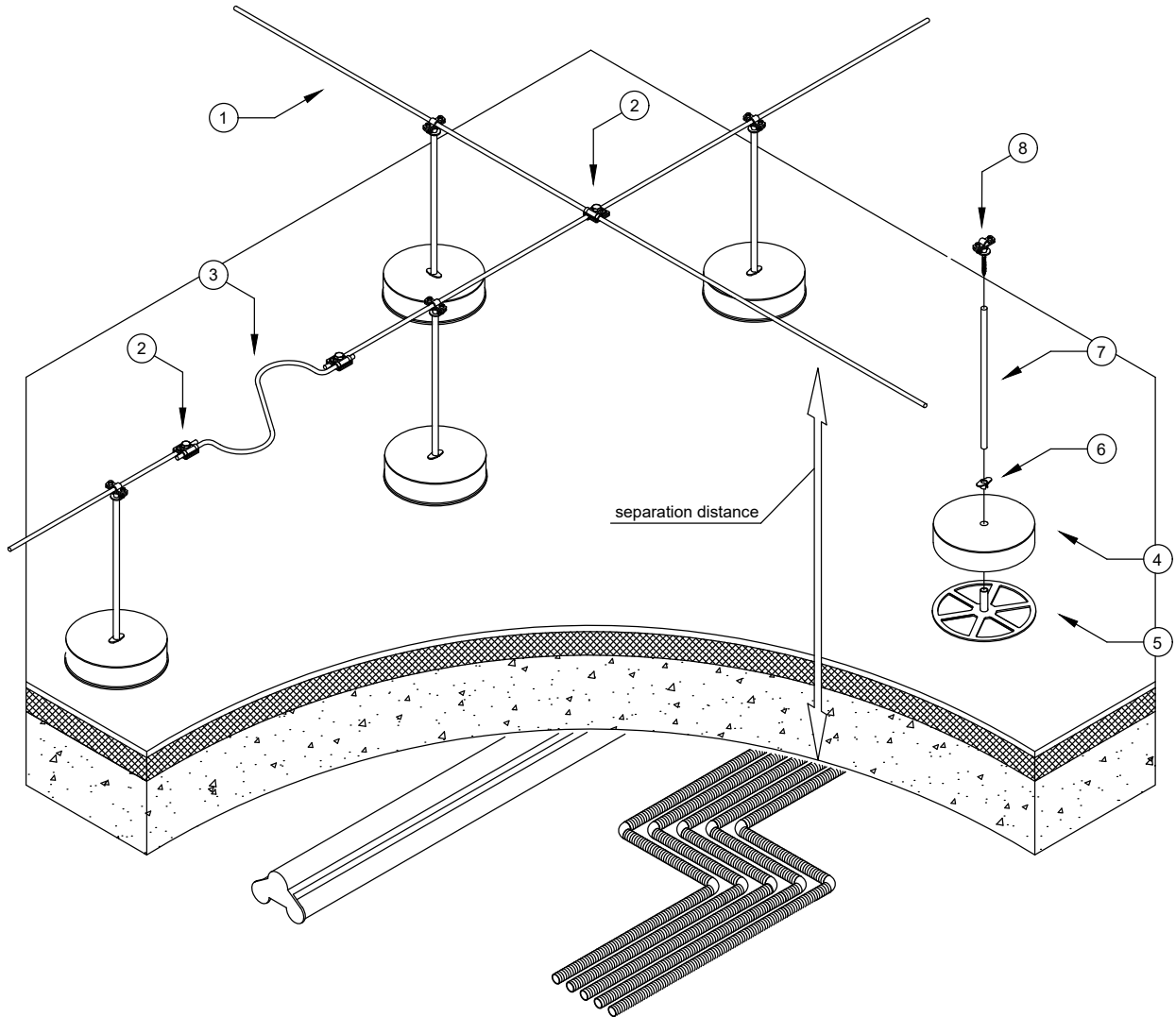
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5230322	113 B-Z-HD	Cable bracket with crossbar, wood screw, plastic anchor	
3	5402864	101 3B-4000	isFang air-termination rod	
4	5408954	isFang TW200	isFang support for wall mounting	
5	5057515	927 1	Earthing pipe clamp VA	
6	5320707	287 DCT	Connection component with double crossbar	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.15	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roof equipment			
Editor:		Comment:			
Status:		Lightning protection of a chimney. Installation of an isFang interception rod on the wall of the building.			
Ind.	Amendment typical	Date:	Name:		Scale:
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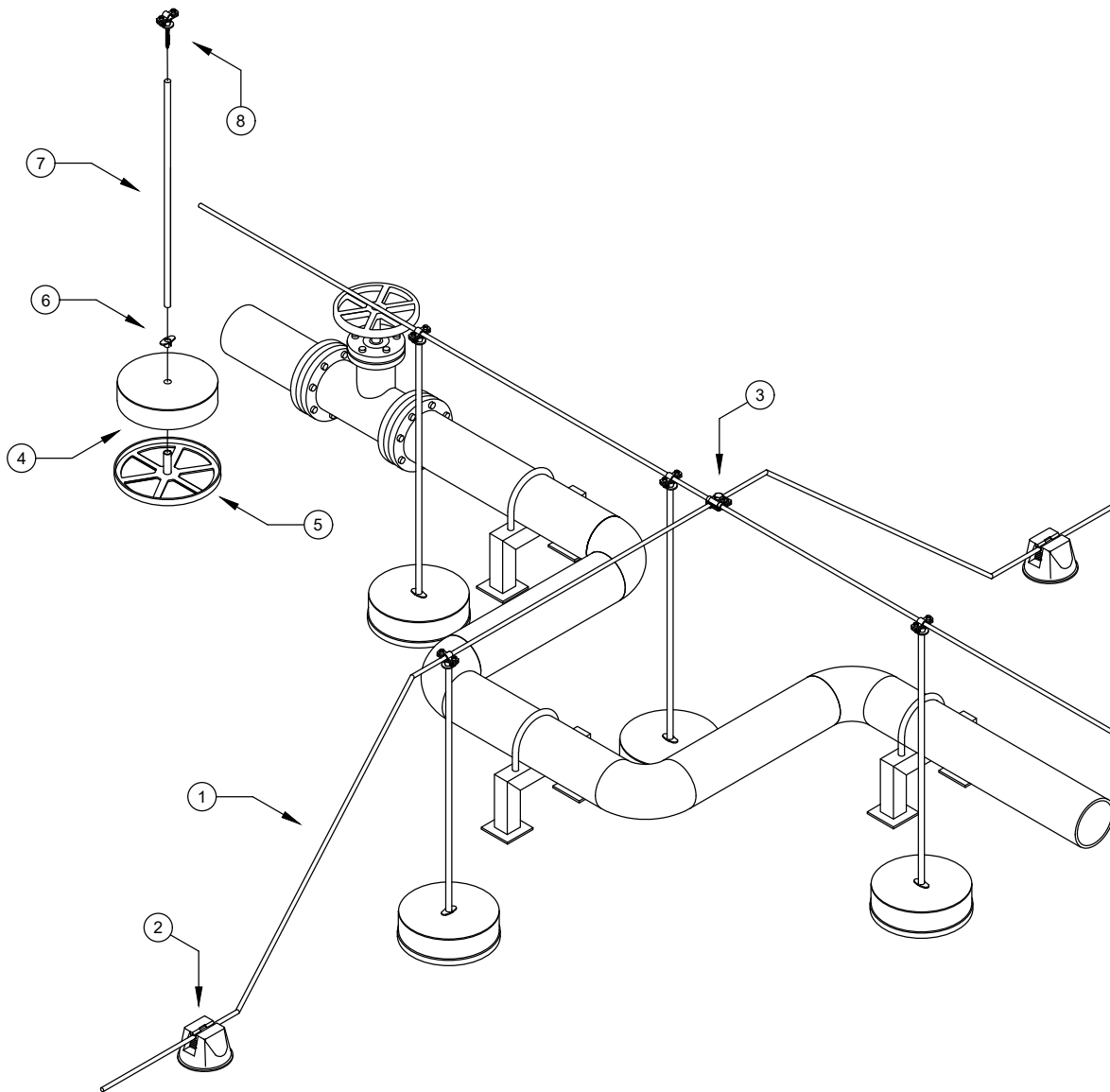
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5311519	249 8-10 ALU	Vario quick connector	
3	5218926	172 AR	Expansion piece	
4	5403117	F-FIX-S10	Concrete block for FangFix system 10 kg	
5	5403124	F-FIX-S10	Base for FangFix system 10 kg	
6	5408101	101 RH-16	FangFix reducing sleeve	
7	5408107	101 16-750	Insulating rod	
8	5229960	113 Z8-10	Cable bracket	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.16	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roof equipment			
Editor:		Comment:			
Status:		Installation of a lightning mesh grid on the roof surface observing the separation distance.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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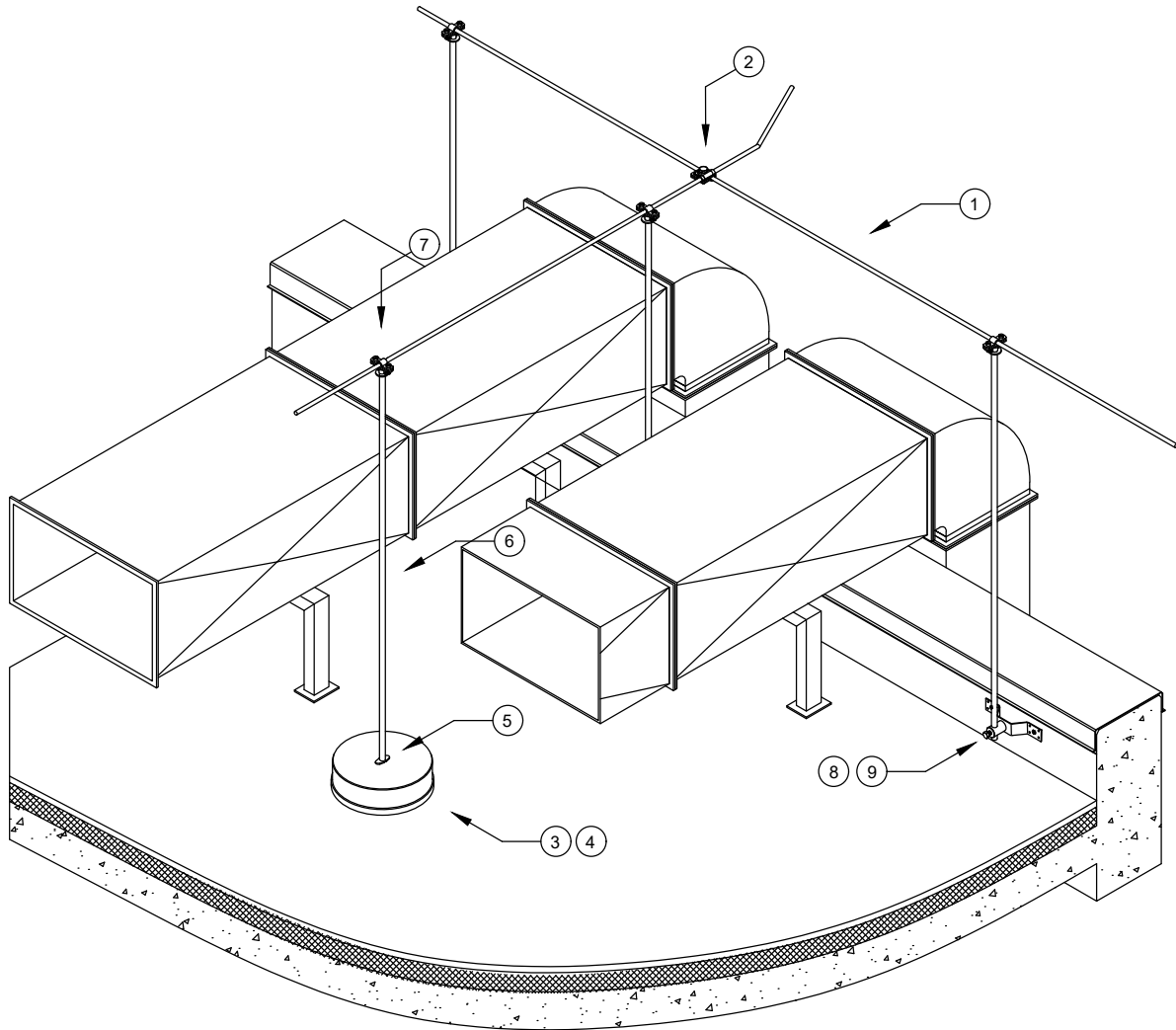
## 2 External lightning protection systems for flat roof equipment




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5311519	249 8-10 ALU	Vario quick connector	
4	5403117	F-FIX-S10	Concrete block for FangFix system 10 kg	
5	5403124	F-FIX-S10	Base for FangFix system 10 kg	
6	5408101	101 RH-16	FangFix reducing sleeve	
7	5408108	101 16-1500	Insulating rod	
8	5229960	113 Z8-10	Cable bracket	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.17	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for flat roof equipment			
Editor:		Comment:			
Status:		Lightning protection of gas pipe on a rooftop. Installation of the lightning mesh grid on the roof surface observing the separation distance.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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## 2 External lightning protection systems for flat roof equipment

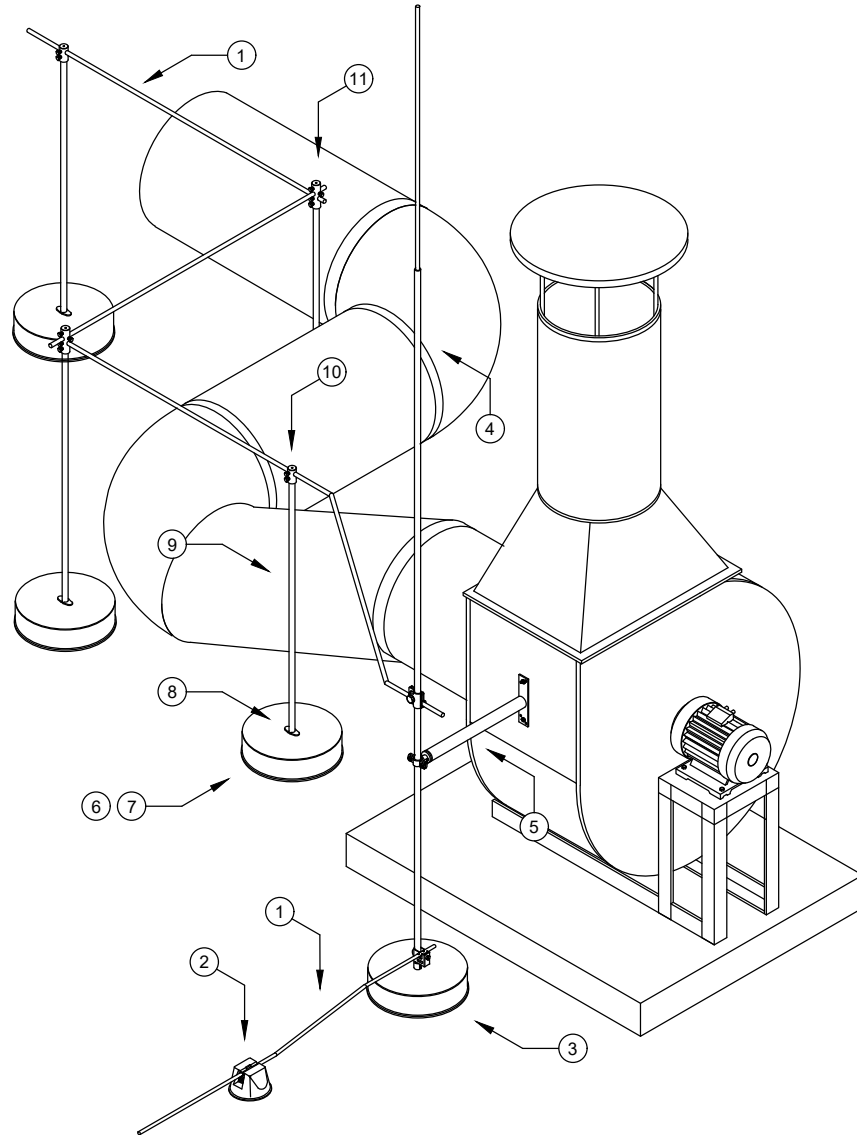


	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5311519	249 8-10 ALU	Vario quick connector	
3	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg	
4	5403235	F-FIX-B16	Base for FangFix system 16 kg	
5	5408101	101 RH-16	FangFix reducing sleeve	
6	5408108	101 16-1500	Insulating rod	
7	5229960	113 Z8-10	Cable bracket	
8	5320712	288 DIN	Bridging cable	
9	5408988	101 BB-16	Fastening bolts	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.18	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Lightning protection of ventilation duct on a rooftop. Installation of the lightning mesh grid on insulated rods.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:



## 2 External lightning protection systems for flat roof equipment

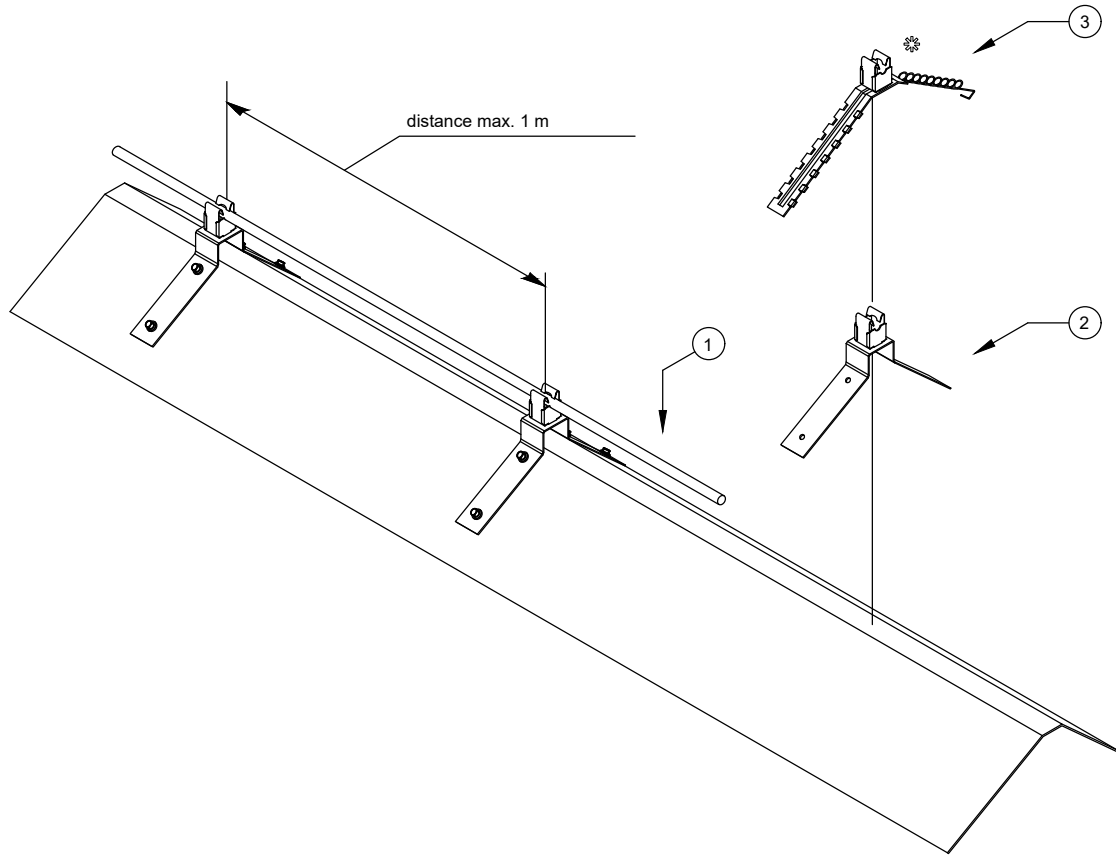


	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU T	Round conductor, aluminium	
2	5218700	165 MBG-8-10	Roof conductor holder for flat roofs	
3	5403200	F-FIX-16	Stand for FangFix system 16 kg	
4	5401993	101 VL3500	Tapered pipe air-termination rod	
5	5408806	ISO-A-500	Insulated spacer	
6	5403117	F-FIX-S10	Concrete block for Fangix system 10 kg	
7	5403124	F-FIX-B10	Base for FangFix system 10 kg	
8	5408101	101 RH-16	FangFix reducing sleeve	
9	5408108	101 16-1500	Insulating rod	
10	5408395	101 IES	End piece	
11	5408245	101 IDK	DK connector	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T2.19	Project No.:
Date:	Name:	Description: The external lightning protection system for flat roof equipment  Comment: Lightning protection of ventilation system on the rooftop. Installation of the insulated lightning protection system.			
Creator:					
Editor:					
Status:					
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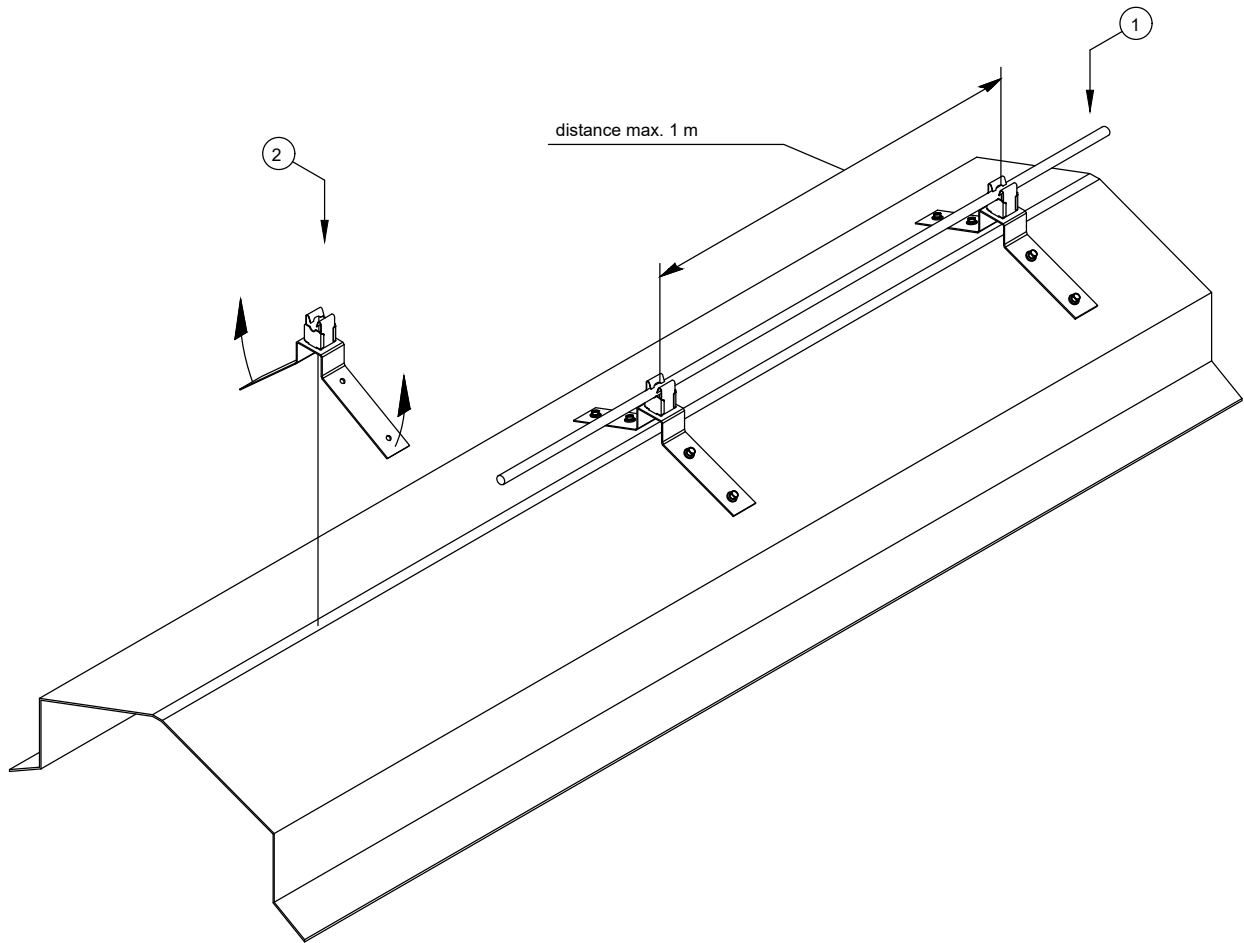
### 3 External lightning protection systems for pitched roofs





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202510	132 P VA	Roof conductor holder for ridge tiles	
3*	5203015	132 U	Ridge conductor holder with tensioning spring 8 mm	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.01	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing the round conductor on the ridge and hips of the pitched roof ridge. Simple ridge cover.			
Creator:					
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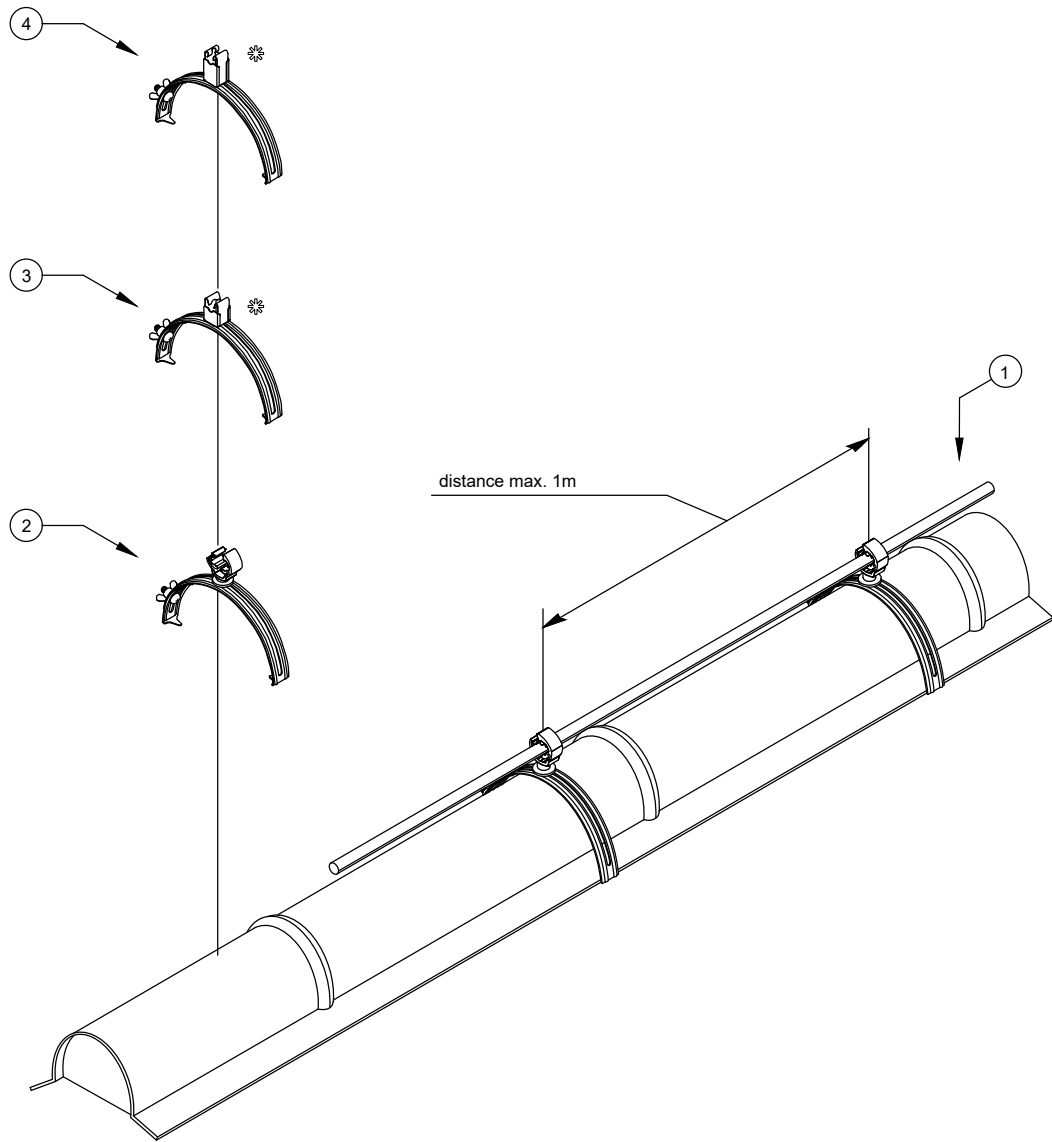
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202510	132 P VA	Roof conductor holder for ridge tiles	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.02	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing a round conductor on the ridge and hips of the pitched roof ridge. Angle ridge cap.			
Creator:					
Editor:					
Status:					
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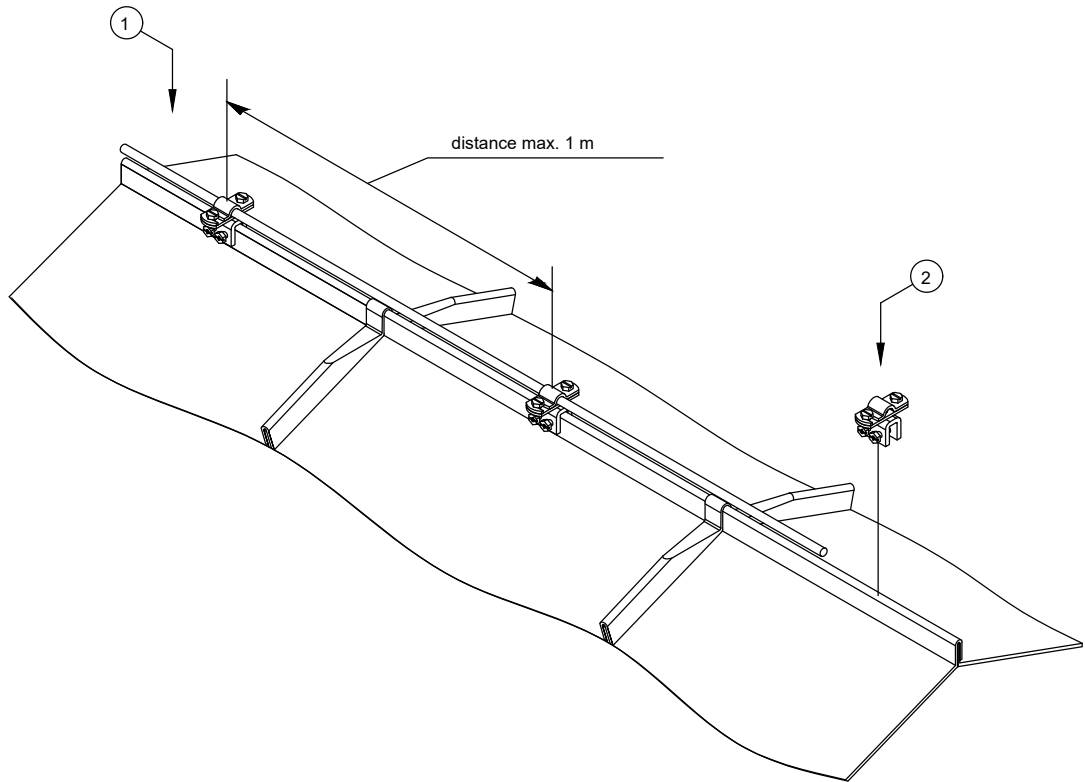
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202515	132 K VA	Roof conductor holder for ridge tiles	
3*	5202833	132 VA	Roof conductor holder for rodge tiles	
4*	5202836	132 VA 35	Roof conductor holder for ridge tiles	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.03	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing a round conductor on the ridge and hips of the pitched roof. A tiled ridge		
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

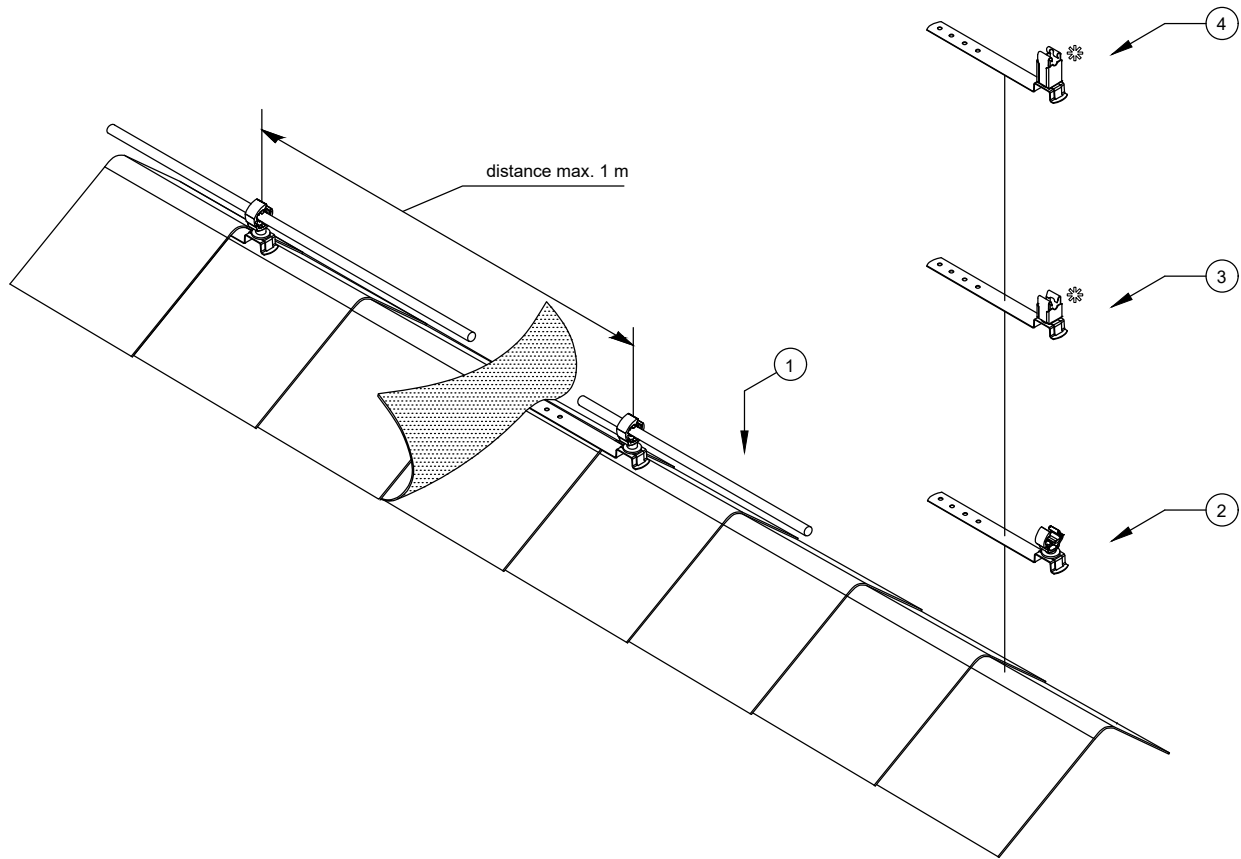
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5317208	270 8-10 VA	Folding clamp Rd 8-10 to 10 mm plate thickness	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.04	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing a round conductor on the ridge and hips of the pitched roof. A folding ridge.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:	 BETTERMANN	Scale: Sheet: of:

### 3 External lightning protection systems for pitched roofs

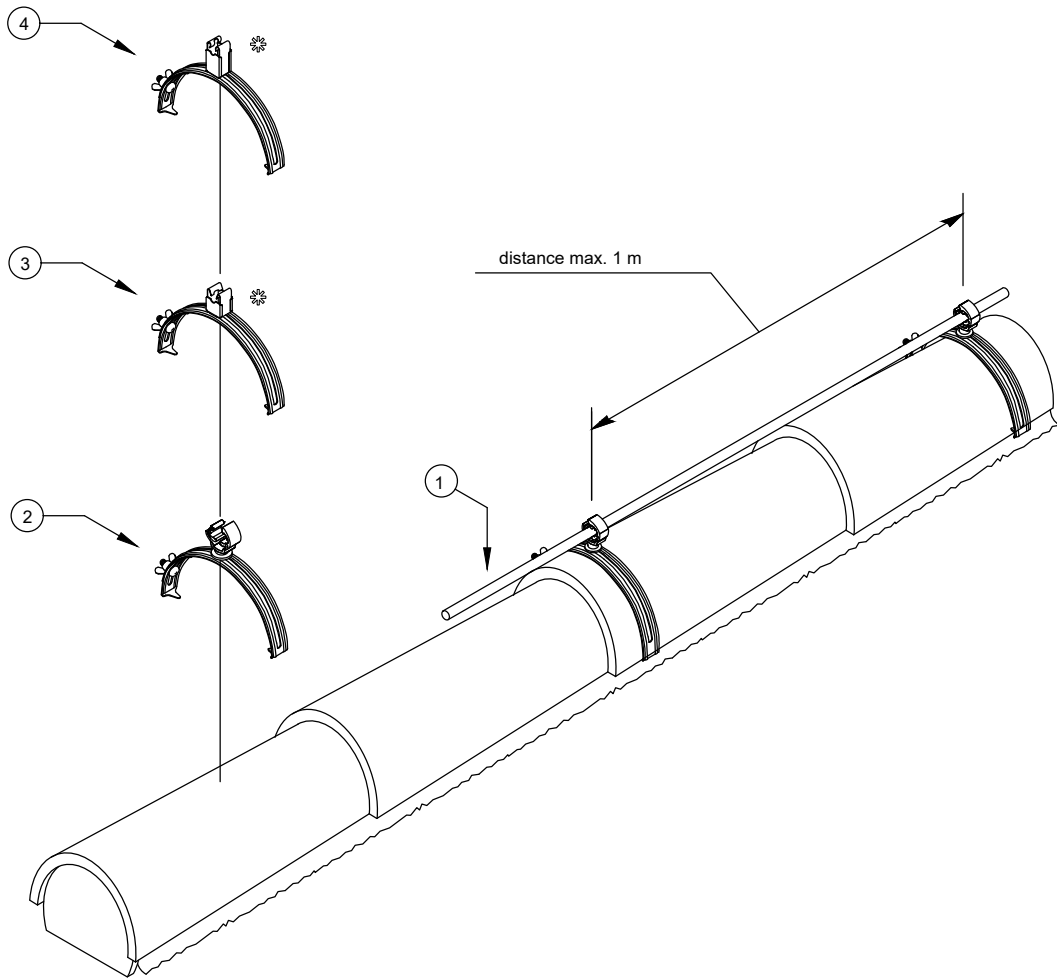


	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5215544	157 FK VA 230	Roof conductor holder for tiled roofs	
3*	5215552	157 F VA 230	Roof conductor holder for tiled roofs	
4*	5215555	157 F VA 230 35	Roof conductor holder for tiled roofs	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.05	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing a round conductor on the ridge and hips of the pitched roof. The soft tiled ridge.		
Editor:					
Status:					
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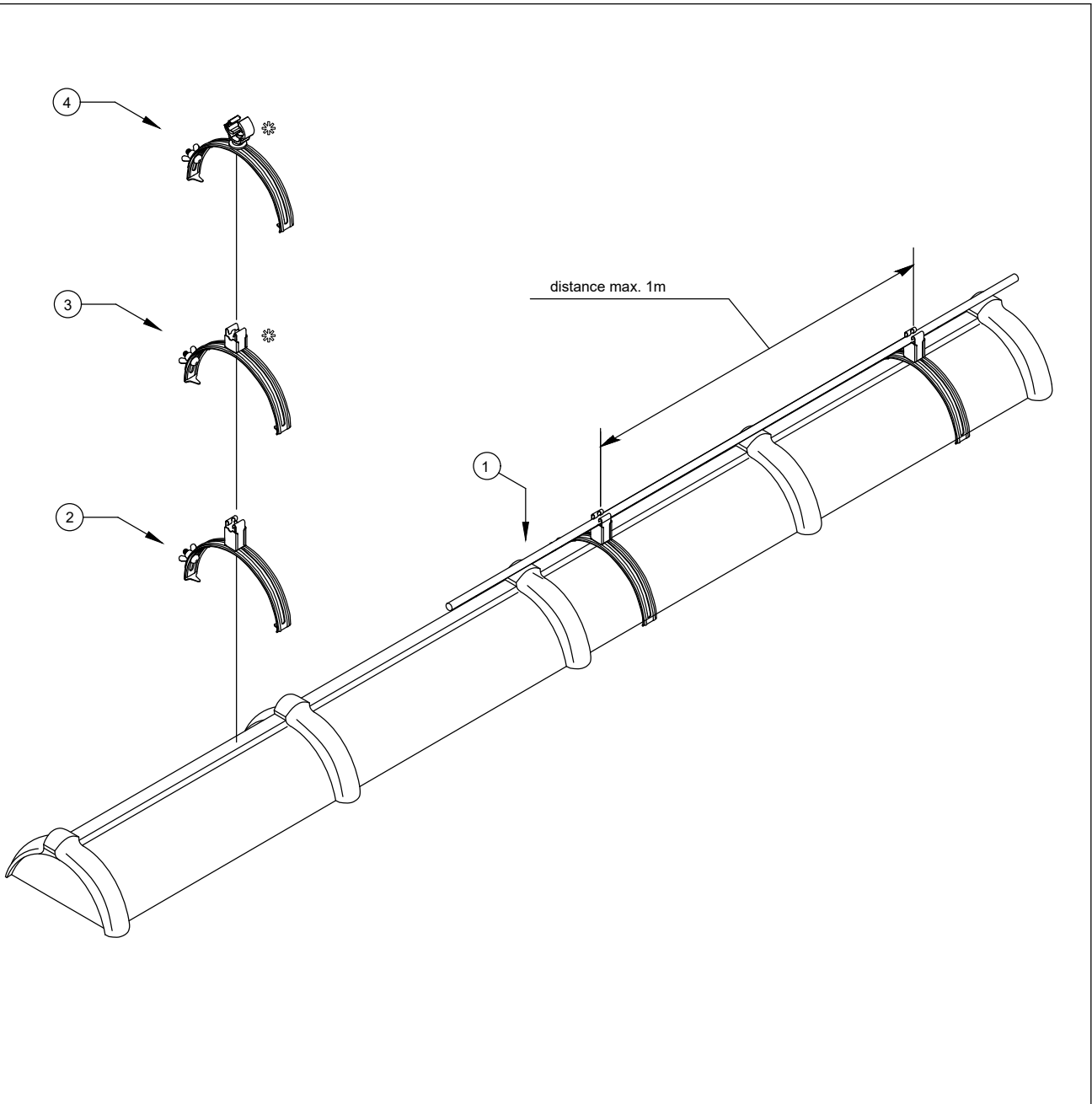
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202515	132 K VA	Roof conductor holder for ridge tiles	
3*	5202833	132 VA	Roof conductor holder for rodge tiles	
4*	5202836	132 VA 35	Roof conductor holder for ridge tiles	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.06	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing a round conductor on the ridge and hips of the pitched roof. Ceramic ridge.			
Creator:					
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Ind.	Amendment typical	Date:	Name:		

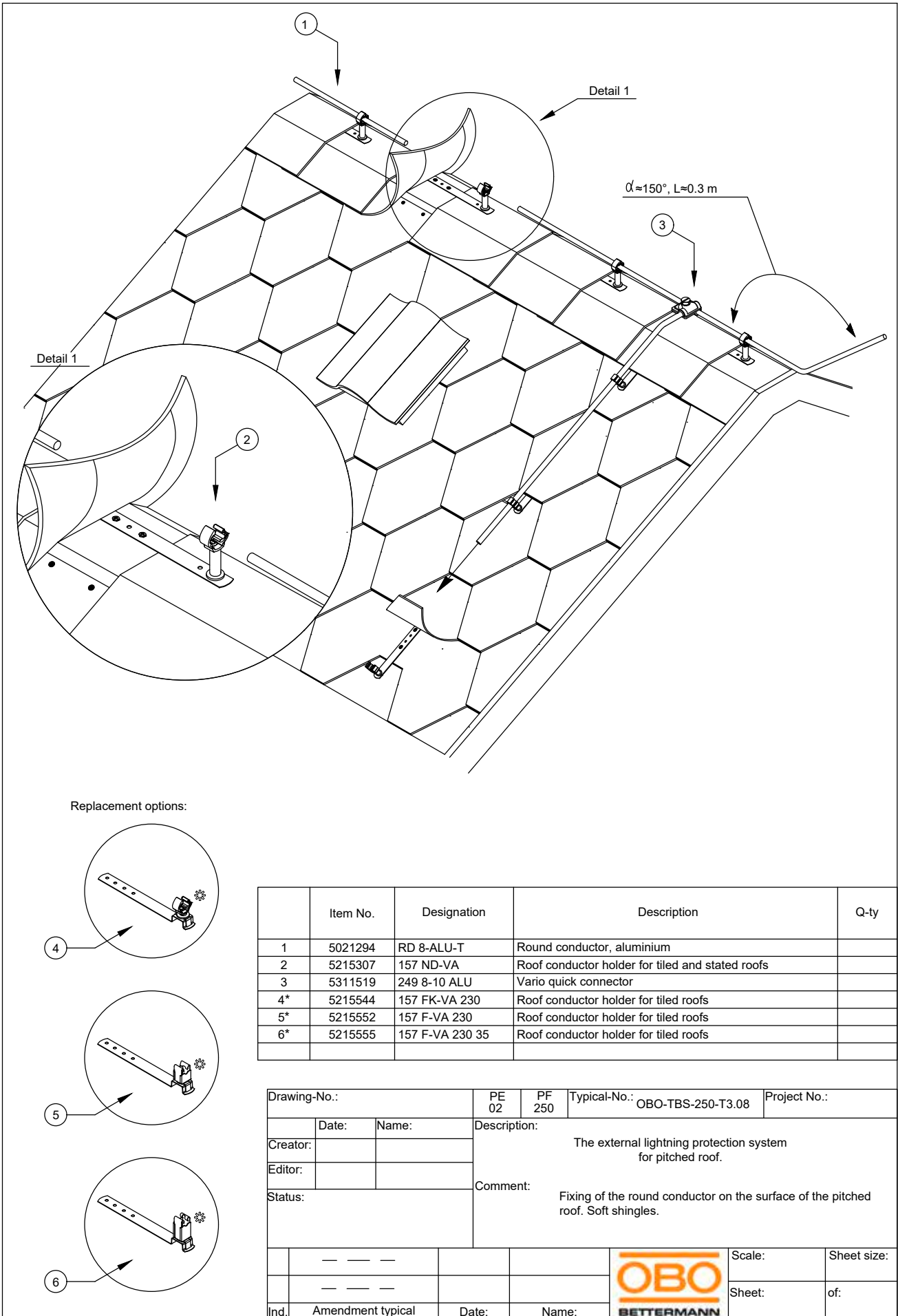
### 3 External lightning protection systems for pitched roofs



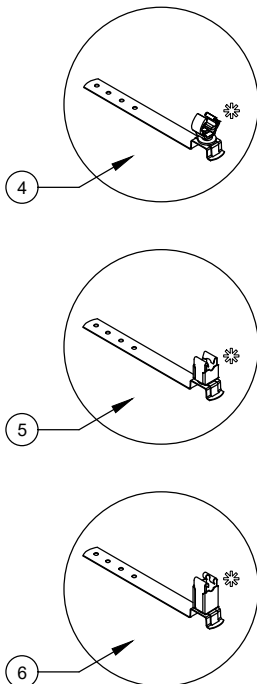
	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202836	132 VA 35	Roof conductor holder for ridge tiles	
3*	5202833	132 VA	Roof conductor holder for rodge tiles	
4*	5202515	132 K VA	Roof conductor holder for ridge tiles	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.07	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing a round conductor on the ridge and hips of the pitched roof. The ridge is ceramic.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:	 BETTERMANN	Scale: Sheet: of:

### 3 External lightning protection systems for pitched roofs



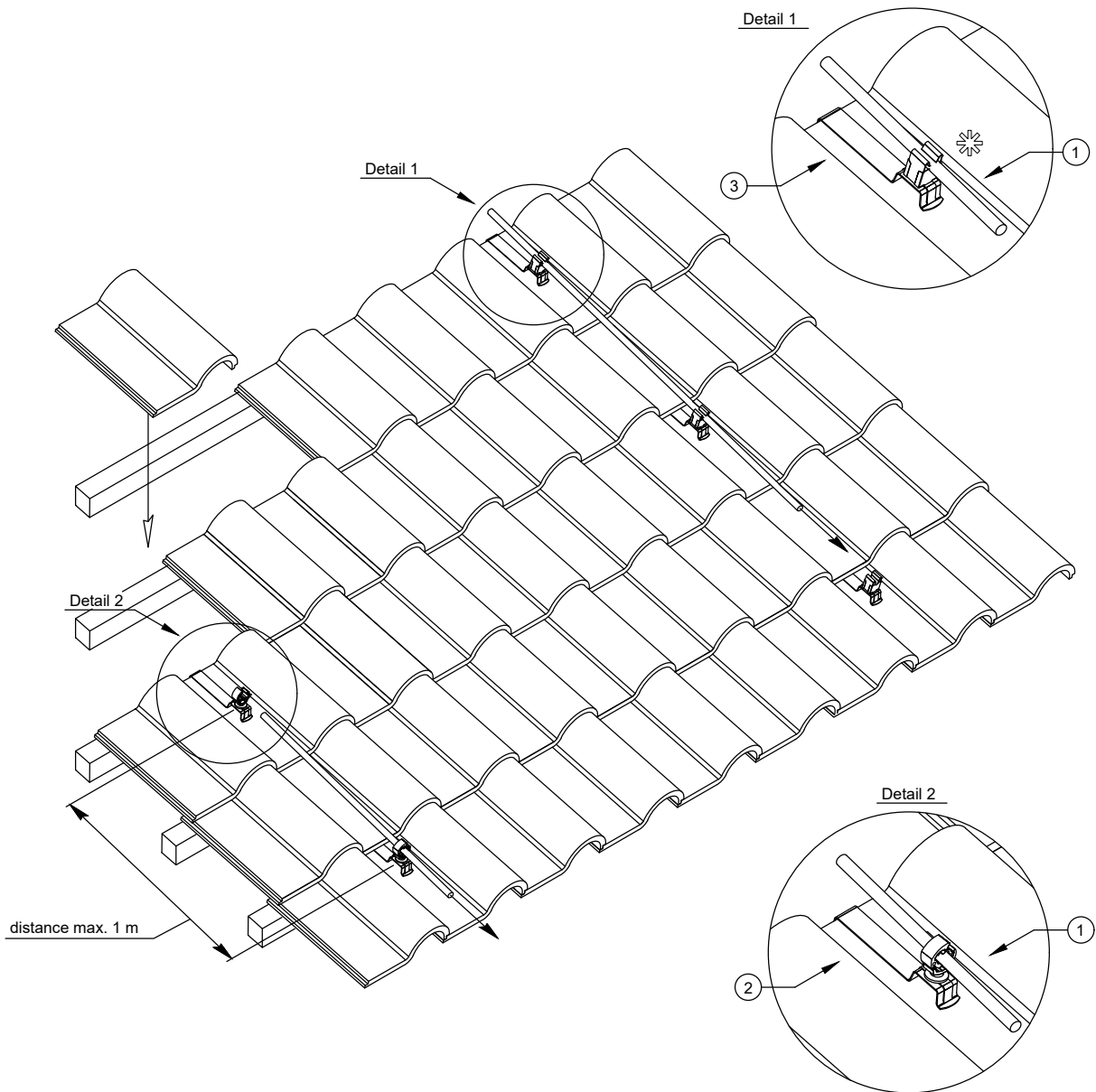
Replacement options:




	Item No.	Designation	Description	Q-ty
	1	5021294 RD 8-ALU-T	Round conductor, aluminium	
	2	5215307 157 ND-VA	Roof conductor holder for tiled and slated roofs	
	3	5311519 249 8-10 ALU	Vario quick connector	
	4*	5215544 157 FK-VA 230	Roof conductor holder for tiled roofs	
	5*	5215552 157 F-VA 230	Roof conductor holder for tiled roofs	
	6*	5215555 157 F-VA 230 35	Roof conductor holder for tiled roofs	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.08	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.			
Creator:		Comment: Fixing of the round conductor on the surface of the pitched roof. Soft shingles.			
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:	OBO BETTERMANN	Scale: Sheet: of:
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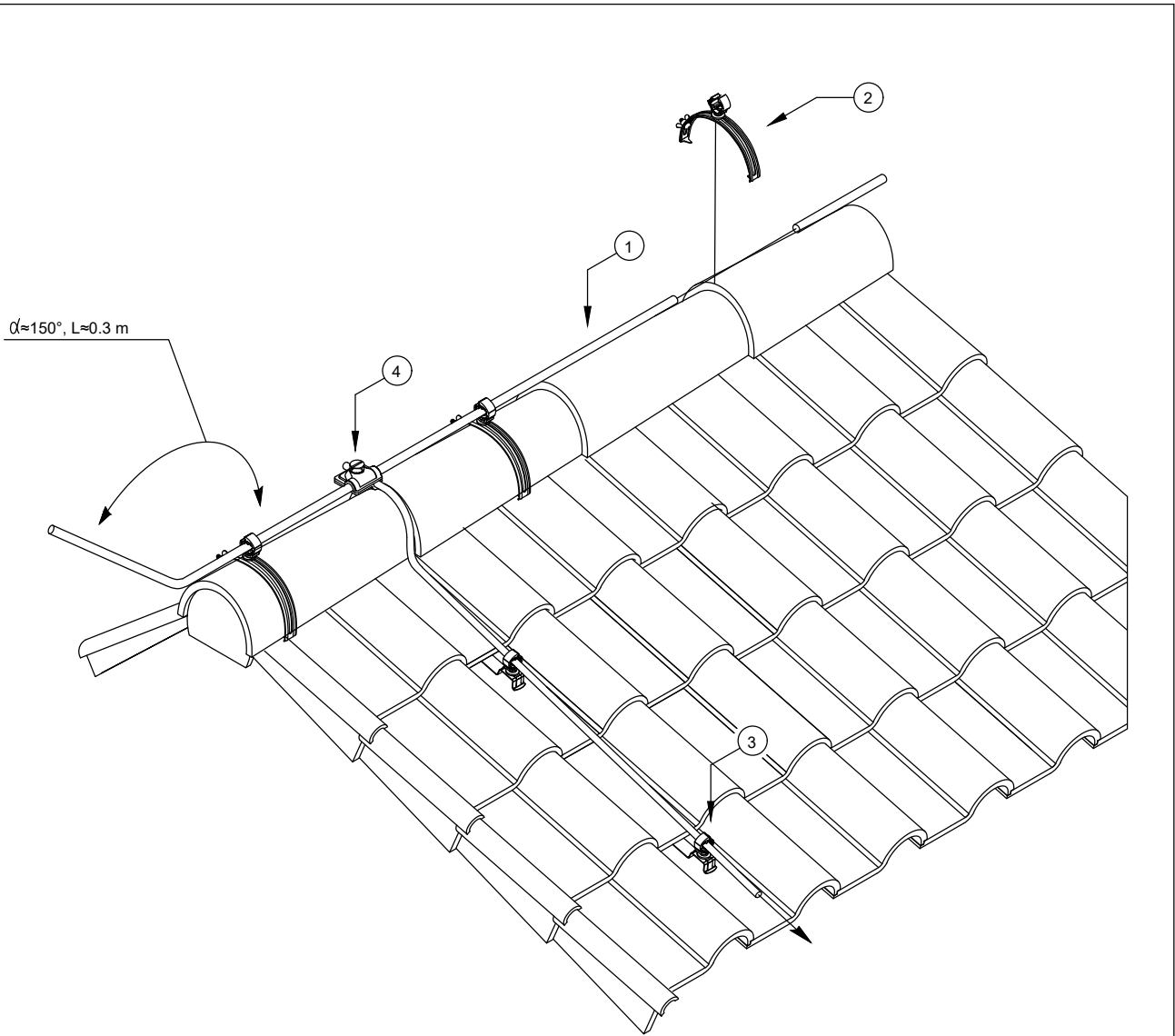
### 3 External lightning protection systems for pitched roofs



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5215668	157 IK-VA	Roof conductor holder for tiled roofs	
3*	5215625	157 I-VA	Roof conductor holder for tiled roofs	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.09	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing of the round conductor on the surface of the pitched roof. Ceramic tiles.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

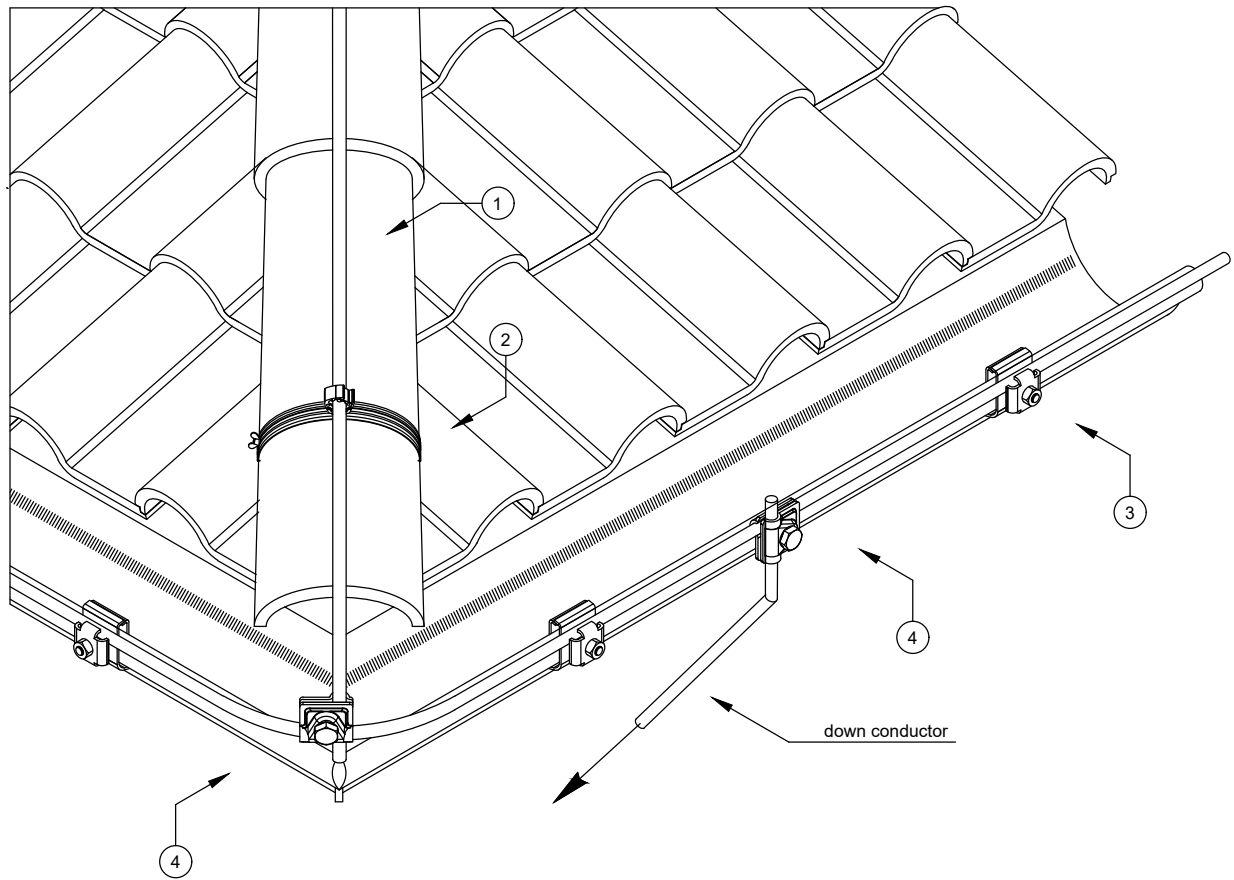
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202515	132 K-VA	Roof conductor holder for ridge tiles	
3	5215668	157 IK-VA	Roof conductor holder for tiled roofs, angled	
4	5311519	249 8-10 ALU	Varío quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.10	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.			
Creator:		Comment: Fixing of the round conductor on the surface of the pitched roof. Ceramic tiles.			
Editor:					
Status:					
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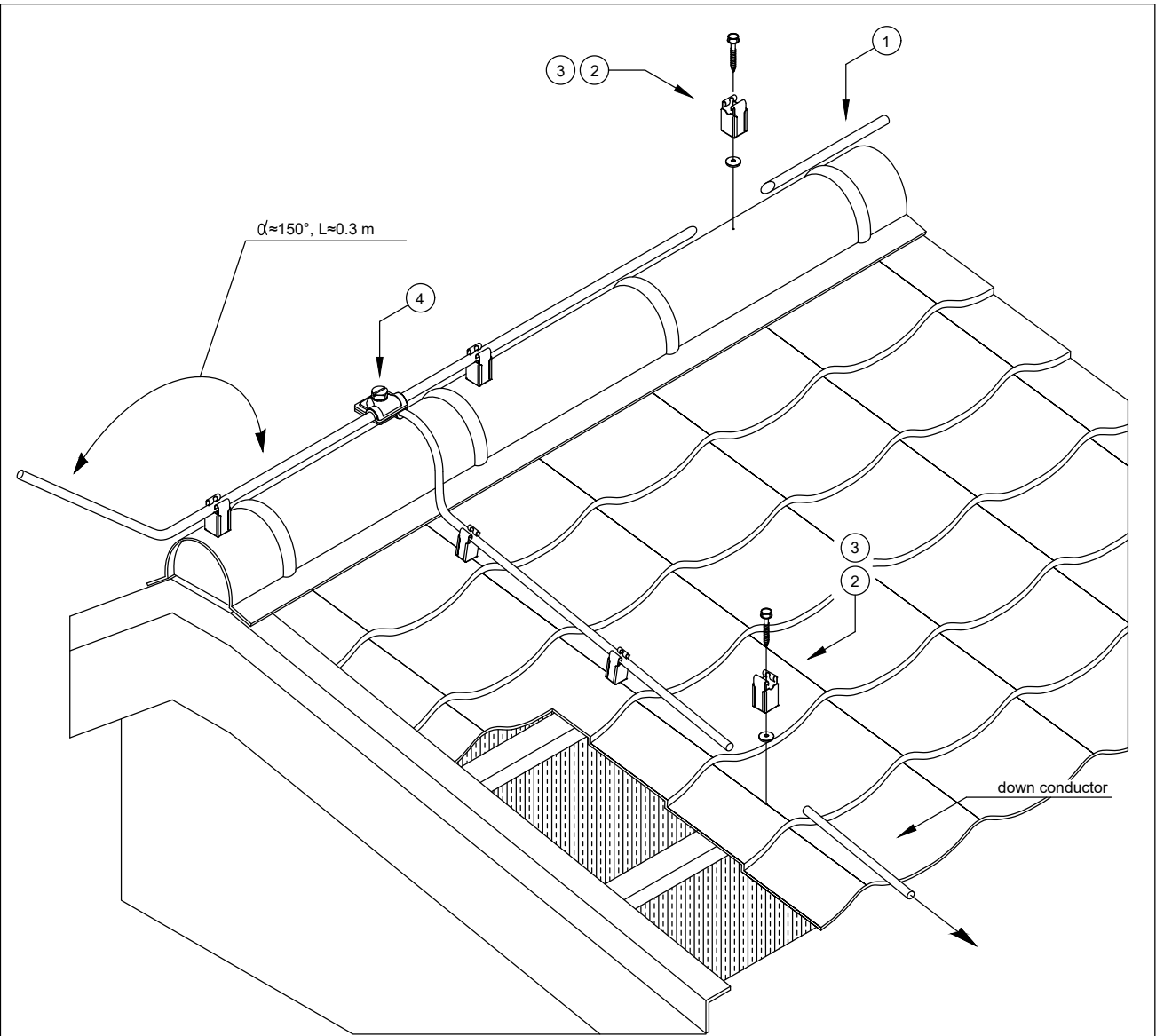
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202515	132 K-VA	Roof conductor holder for ridge tiles	
3	5316459	RK-FIX VA	Gutter clamp RK-FIX	
4	5311519	249 8-10 ALU	Vario quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.11	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for pitched roof.		
Editor:			Comment: Fixing the round conductor to the gutter.		
Status:					
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
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### 3 External lightning protection systems for pitched roofs

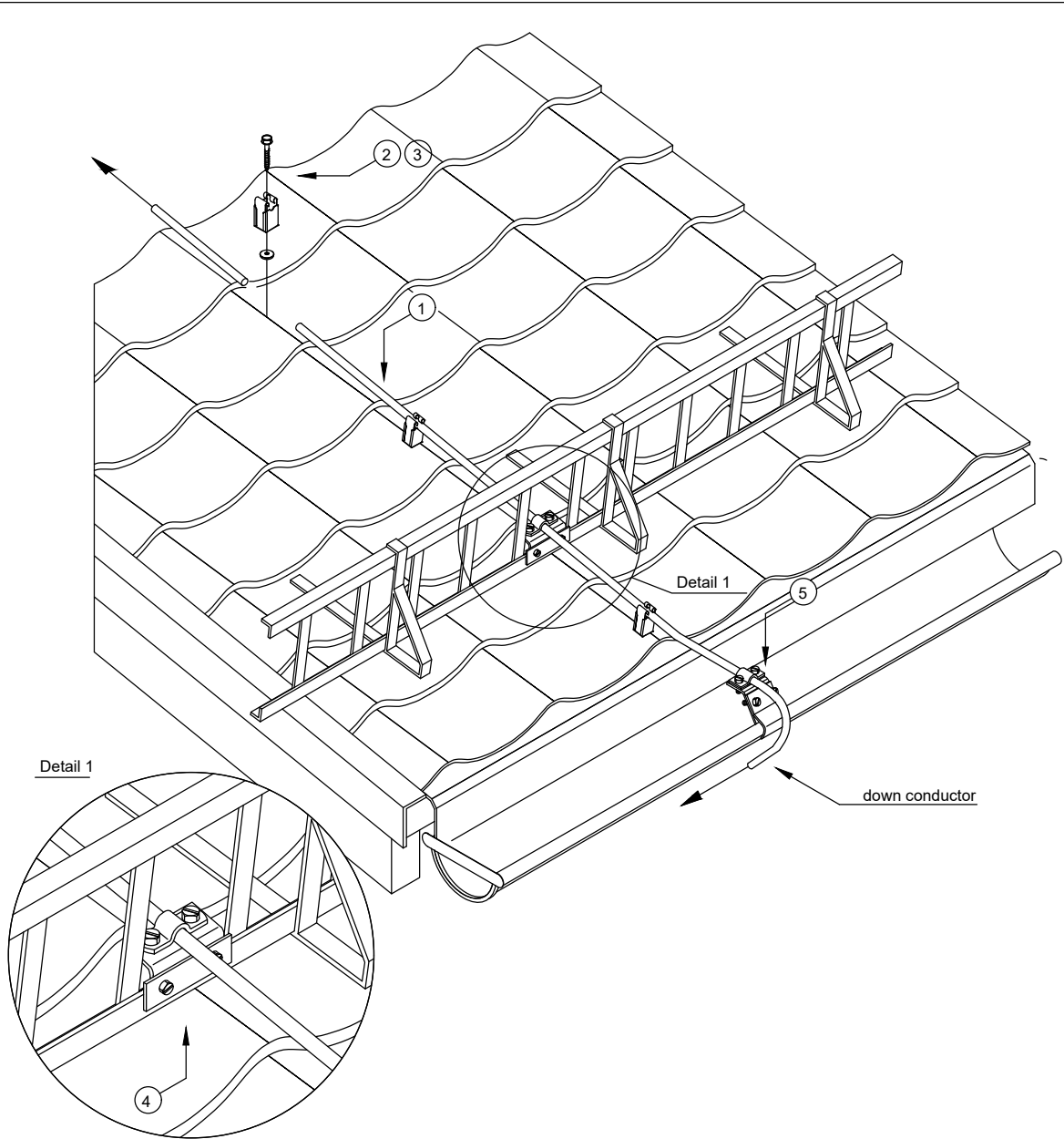


	Item No.	Designation	Description	Q-ty	
	1	5021294	RD 8-ALU-T	Round conductor, aluminium	
	2	5207342	177 35 VA M6	Screwless cable bracket, raised construction type	
	3			Drilling screw with hexagonal head with rubber washer	
	4	5311519	249 8-10 ALU	Vario quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.12	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for pitched roof.			
Editor:		Comment:			
Status:		Fixing of the round conductor on the surface of the pitched roof. Metal tiles.			
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
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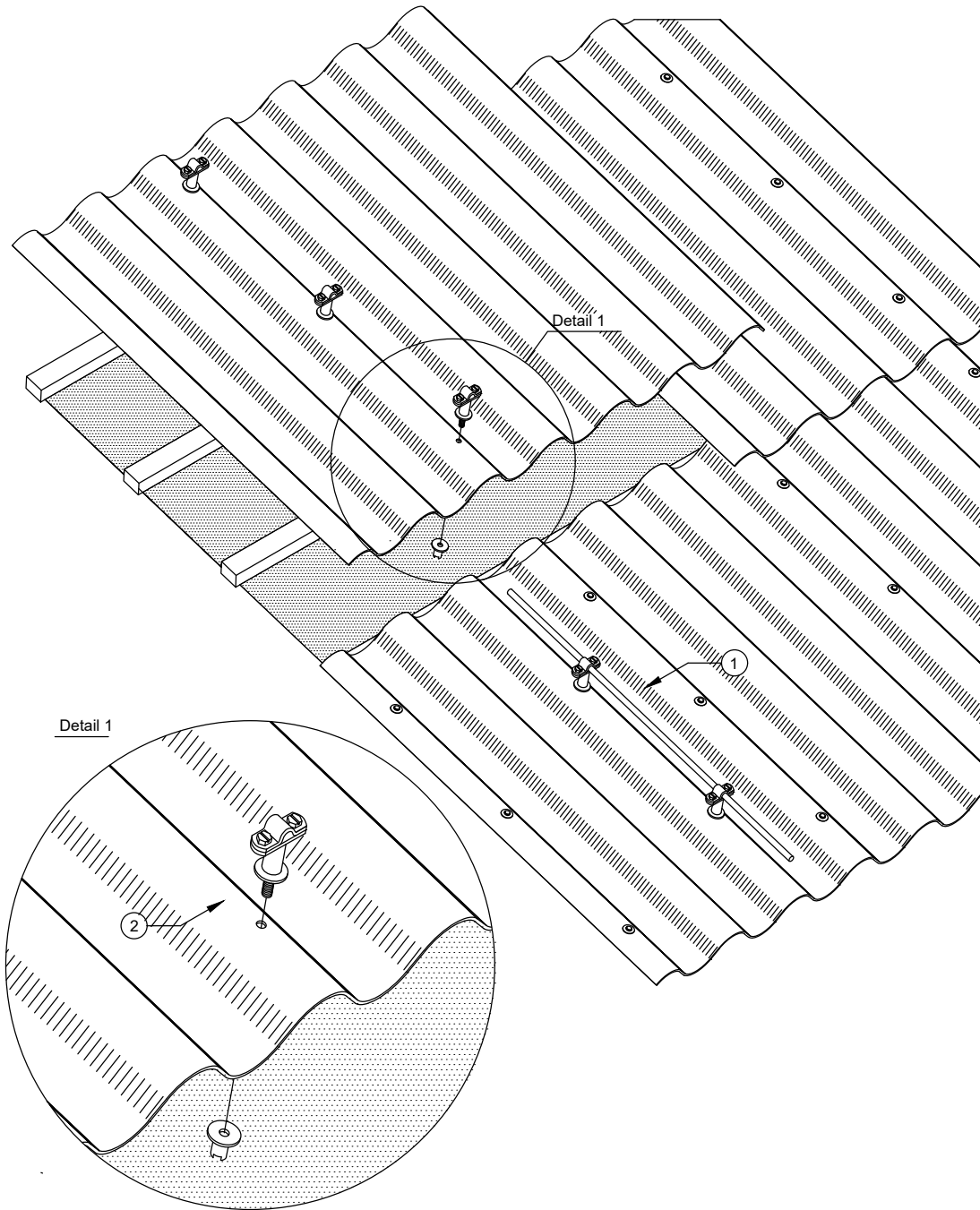
### 3 External lightning protection systems for pitched roofs



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5207342	177 35 VA M6	Screwless cable bracket, raised construction type	
3			Drilling screw with hexagonal head with rubber washer	
4	5316510	264	Snow catching grate clamp	
5	5316014	262	Roof gutter clamp for all bead thicknesses	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.13	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.			
Creator:		Comment: Connection the conductor to the snow holding fence.			
Editor:					
Status:					
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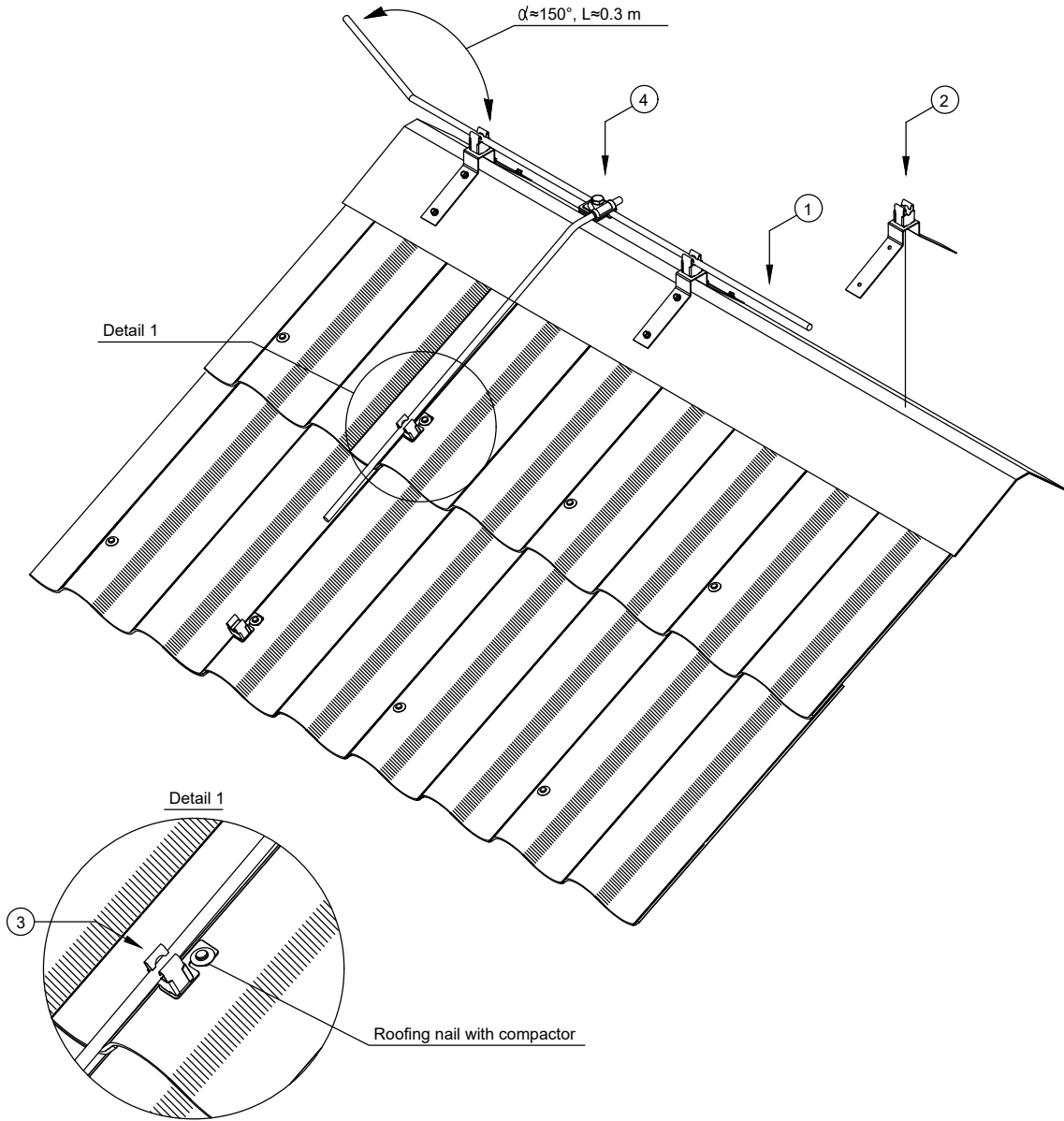
### 3 External lightning protection systems for pitched roofs





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202248	133 A	Roof conductor holder for tiled, slated and corrugated roofs	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.14	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Fixing of the round conductor on the surface of the pitched roof. Slate roof.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

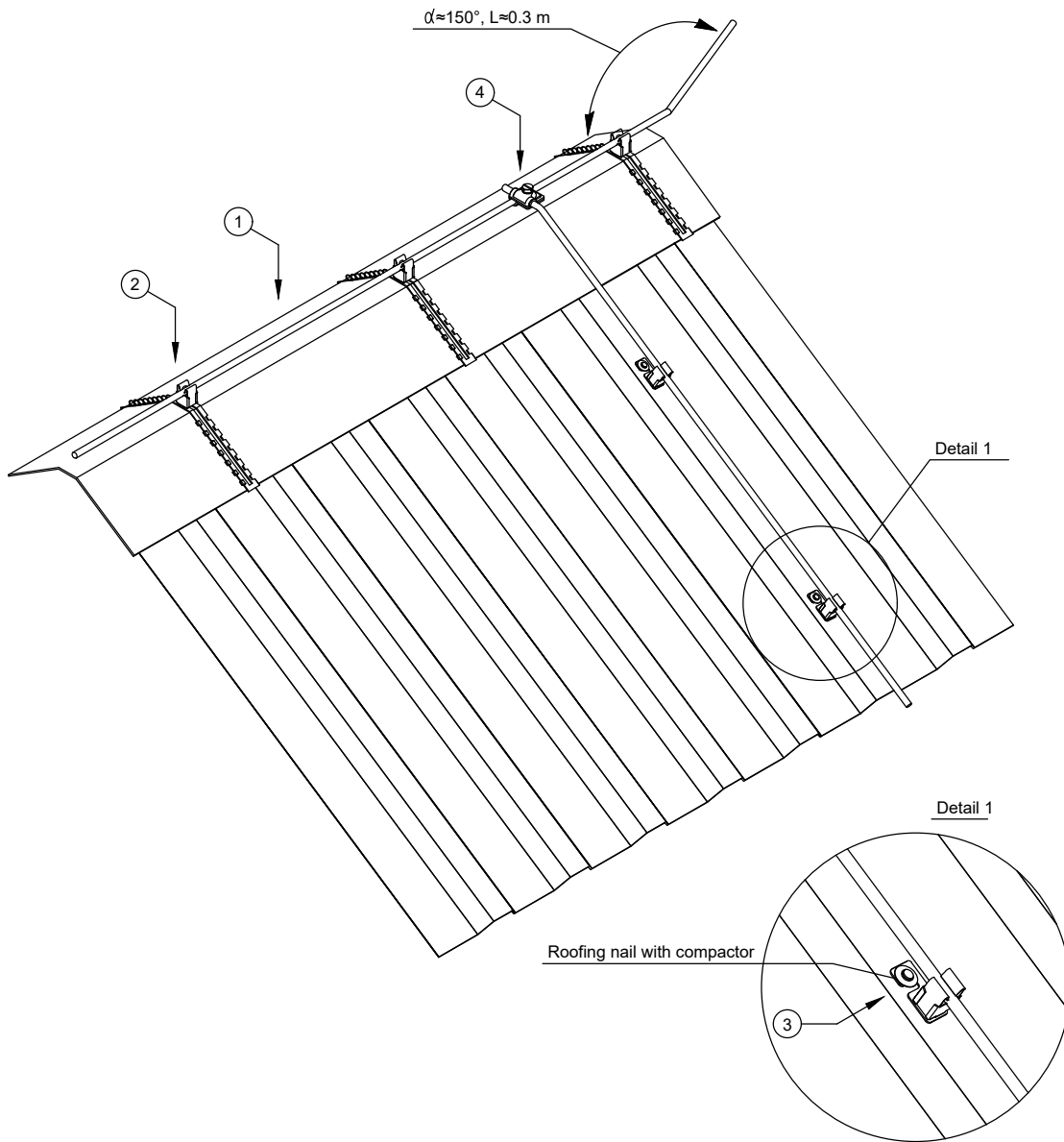
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202510	132 P VA	Roof conductor holder for ridge tiles, metal roofs	
3	5217075	159 VA-V	Roof conductor holder for tiled, slated and corrugated roofs	
4	5311519	249 8-10 ALU	Vario quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.15	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.			
Creator:		Comment: Fixing of the round conductor on the surface of the pitched roof. Slate roof.			
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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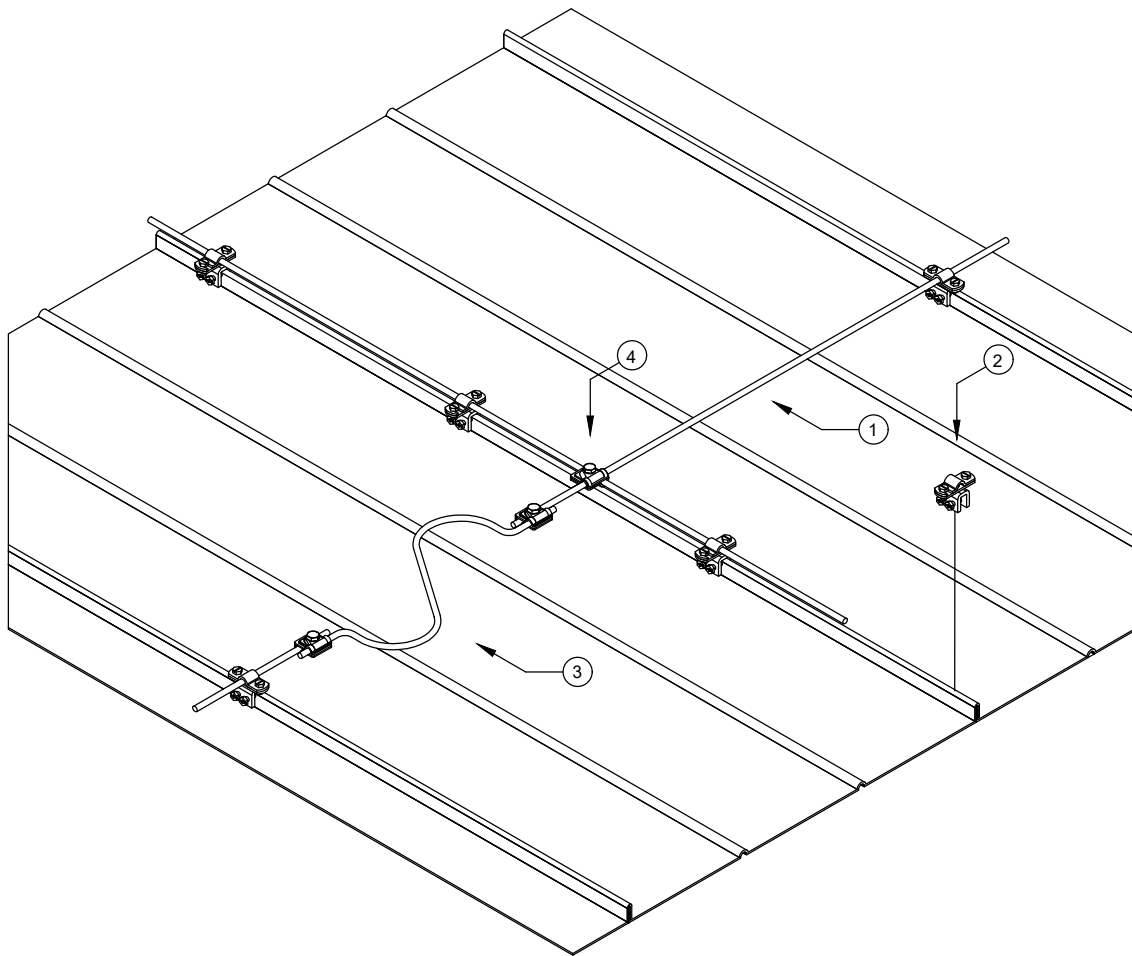
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5203015	132 U	Ridge conductor holder with tensioning spring	
3	5217075	159 VA-V	Roof conductor holder for tiled, slated and corrugated roofs	
4	5311519	249 8-10 ALU	Vario quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.16	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for pitched roof.		
Editor:			Comment: Fixing of the round conductor on the surface of the pitched roof. Trapezoidal sheet metal roof.		
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
					Sheet: of:

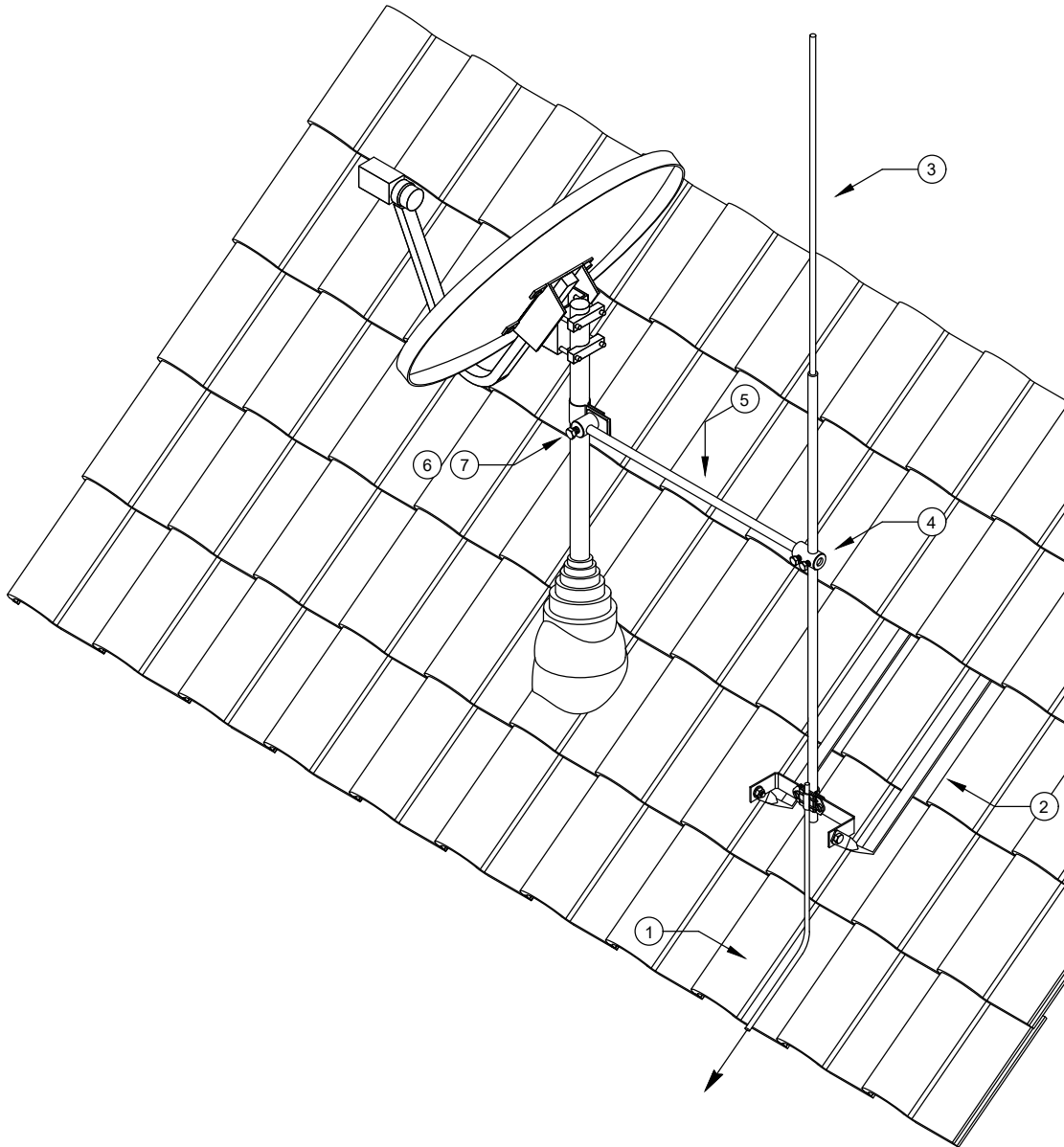
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5317208	270 8-10 VA	Folding clamp Rd 8-10 mm plate thickness	
3	5218926	172 AR	Expansion piece	
4	5311519	249 8-10 ALU	Vario quick connector	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.17	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for pitched roof.		
Editor:			Comment: Fixing of the round conductor on the surface of the pitched roof. Folded roof.		
Status:					
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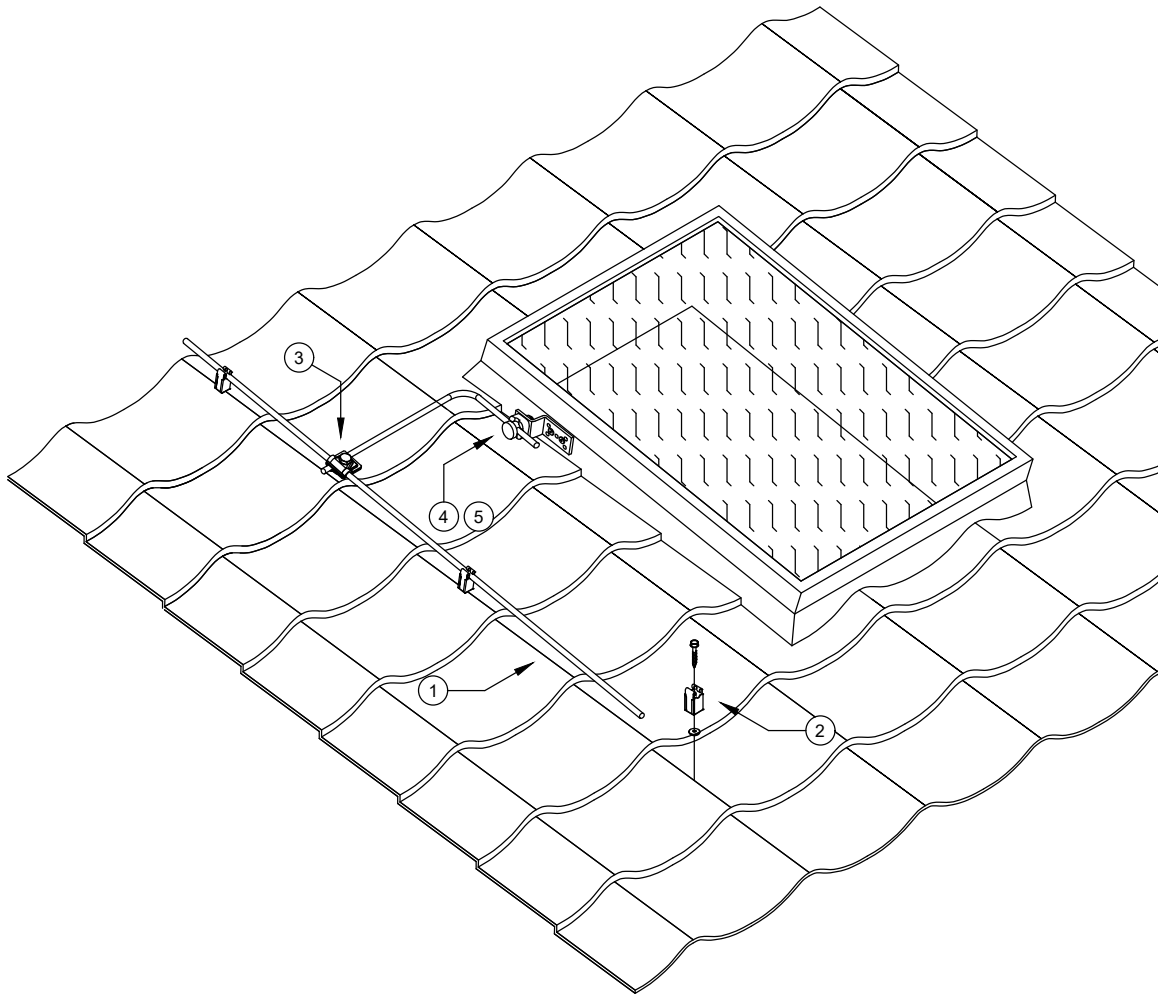
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
	1	5021294	RD 8-ALU-T	Round conductor, aluminium
	2	5403335	SD-Fix	Air-termination rod holder for sloping roof
	3	5401983	101 VL2000	Tapered pipe air-termination rod
	4	5408158	101 IT-16	T connector
	5	5408107	101 16-750	Insulating rod
	6	5102197	303 DIN-2	Pipe clamp
	7	5408988	101 BB-16	Fastening bolts

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.18	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for pitched roof.			
Editor:		Comment:			
Status:		Fastening the lightning interception rod to the satellite antenna			
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	— — —			<b>BETTERMANN</b>	Sheet size:
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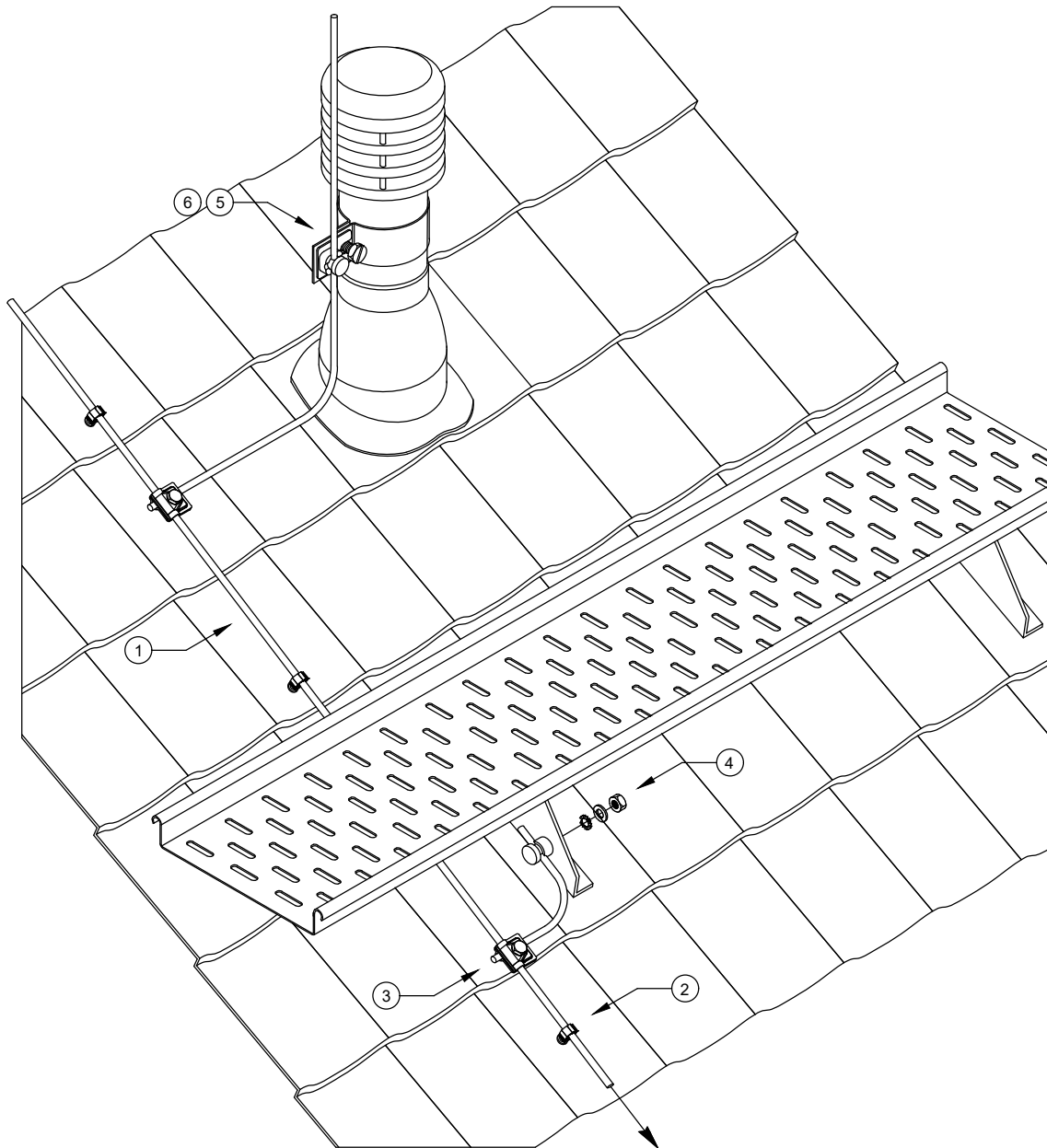
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5207342	177 35 VA M6	Screwless cable bracket, raised construction	
3	5311519	249 8-10 ALU	Vario quick connector	
4	5320704	287	Connection component	
5	5304105	5001 DIN-FT	Connector Rd 8-10 mm, single	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.19	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for pitched roof.		
Editor:			Comment: Connecting the metal frame of the window to the lightning protection grid.		
Status:					
Ind.	Amendment typical	Date:	Name:		Scale:
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### 3 External lightning protection systems for pitched roofs

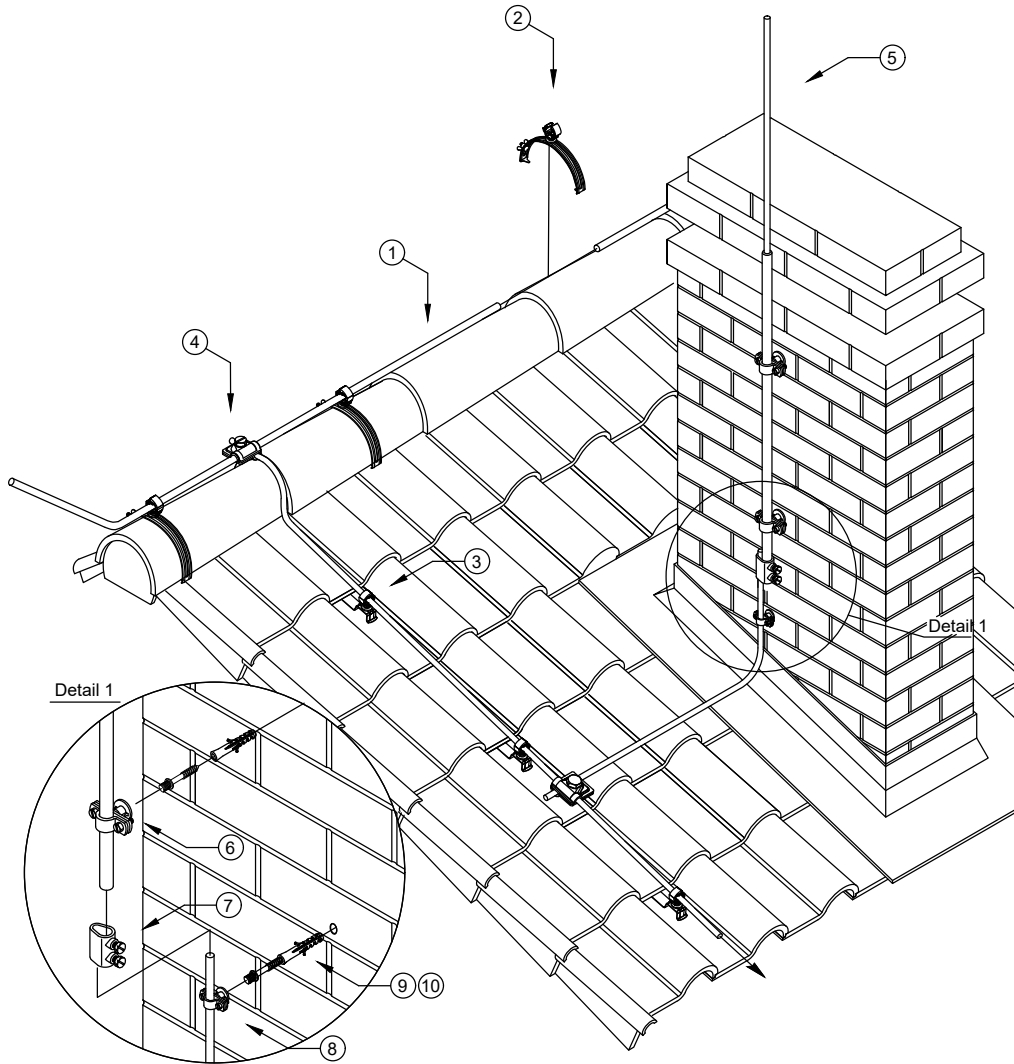


	Item No.	Designation	Description	Q-ty
	1	5021294 RD 8-ALU-T	Round conductor, aluminium	
	2	5207460 177 30 M8	Universal cable bracket	
	3	5311519 249 8-10 ALU	Vario quick connector	
	4	5304176 5001 N-VA	Connector, Rd 8-10 mm with pressure trough	
	5	5350123 301 DIN - 120	Downspout clamp	
	6	5304105 5001 DIN-FT	Connector Rd 8-10 mm, single	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.20	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Connecting the transition bridge to the lightning protection grid			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale:
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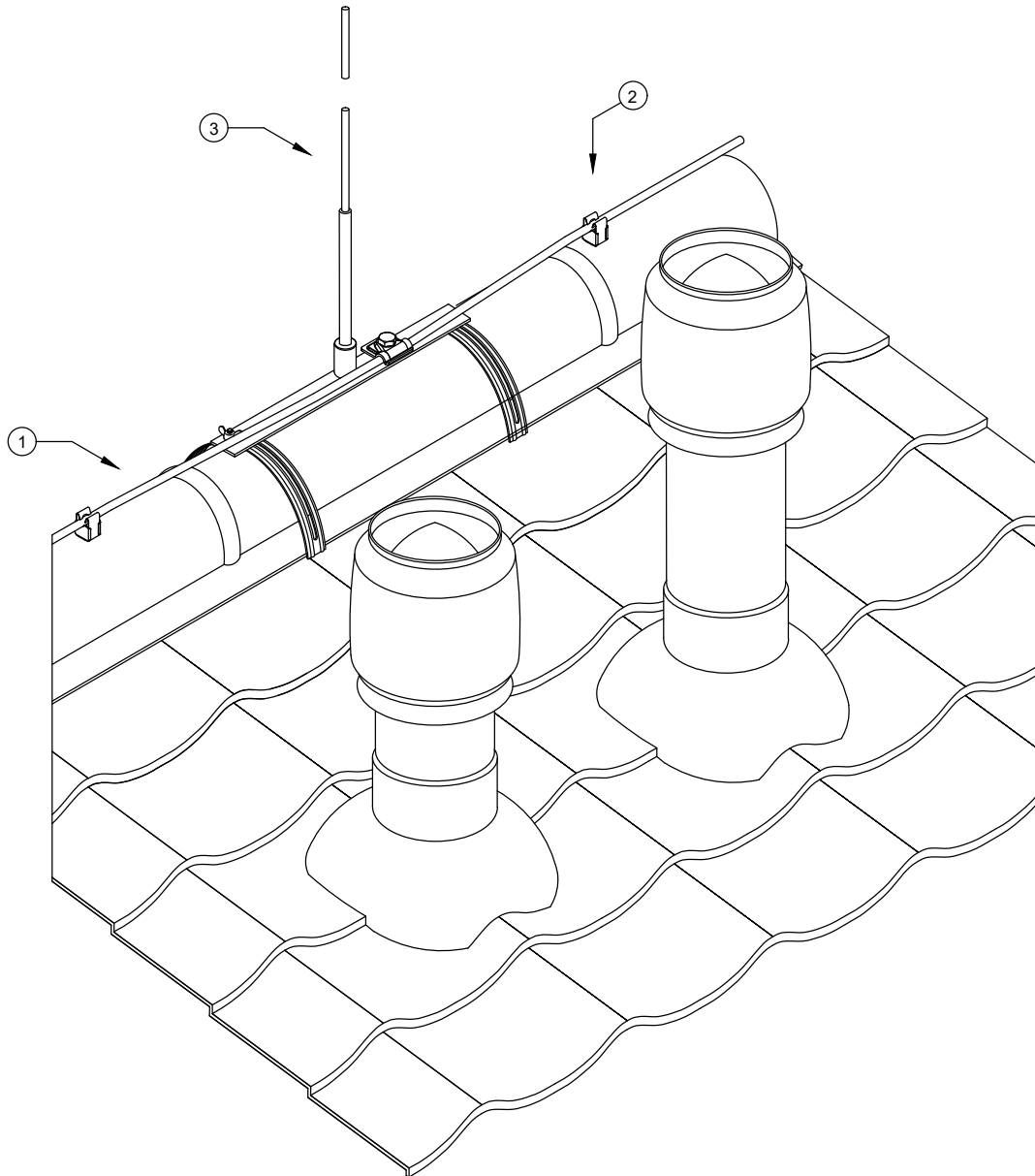
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty	
	1	5021294	RD 8-ALU-T	Round conductor, aluminium	
	2	5202515	132 K-VA	Roof conductor holder for ridge tiles	
	3	5215668	157 IK-VA	Roof conductor holder for tiled roofs, angled	
	4	5311519	249 8-10 ALU	Vario quick connector	
	5	5401986	101 VL2500	Tapered pipe air-termination rod	
	6	5412609	113 Z-16	Rod holder for 16 mm air-termination rods	
	7	5335140	223 O DINZN	Separating piece, open	
	8	5229960	113 Z8-10	Cable bracket with crossbar Rd 8-10 mm	
	9	3133230	985 M8 35	Screw-in anchor with M8 thread	
	10	2349086	910 N 8x40 GRW	Angler spreading anchor	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.21	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system for pitched roof.			
Editor:		Comment:			
Status:		Lightning protection for the chimney. Installation of an interception rod on a brick surface.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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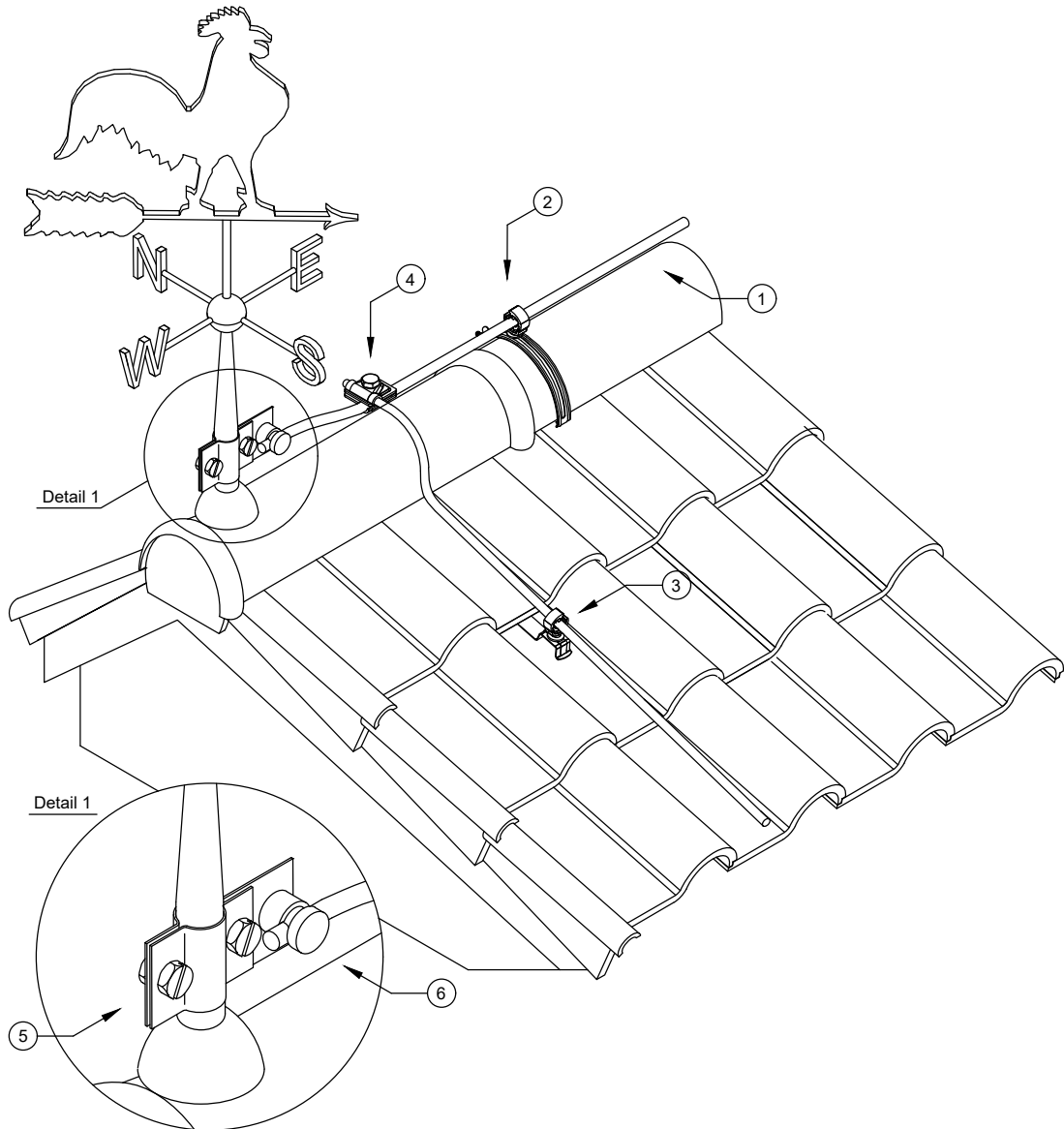
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5207347	177 20 VA M8	Screwless cable bracket for Rd 8 mm, through-way Ø 7 mm	
3	5403330	F-FIX-132	Air-termination rod holder for ridge tiles	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.22	Project No.:
Creator:	Date:	Name:	Description: The external lightning protection system for pitched roof.		
Editor:			Comment: Lightning protection for roof fans. Installation of the interception rod on the roof ridge.		
Status:					
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Ind.	Amendment typical	Date:	Name:		
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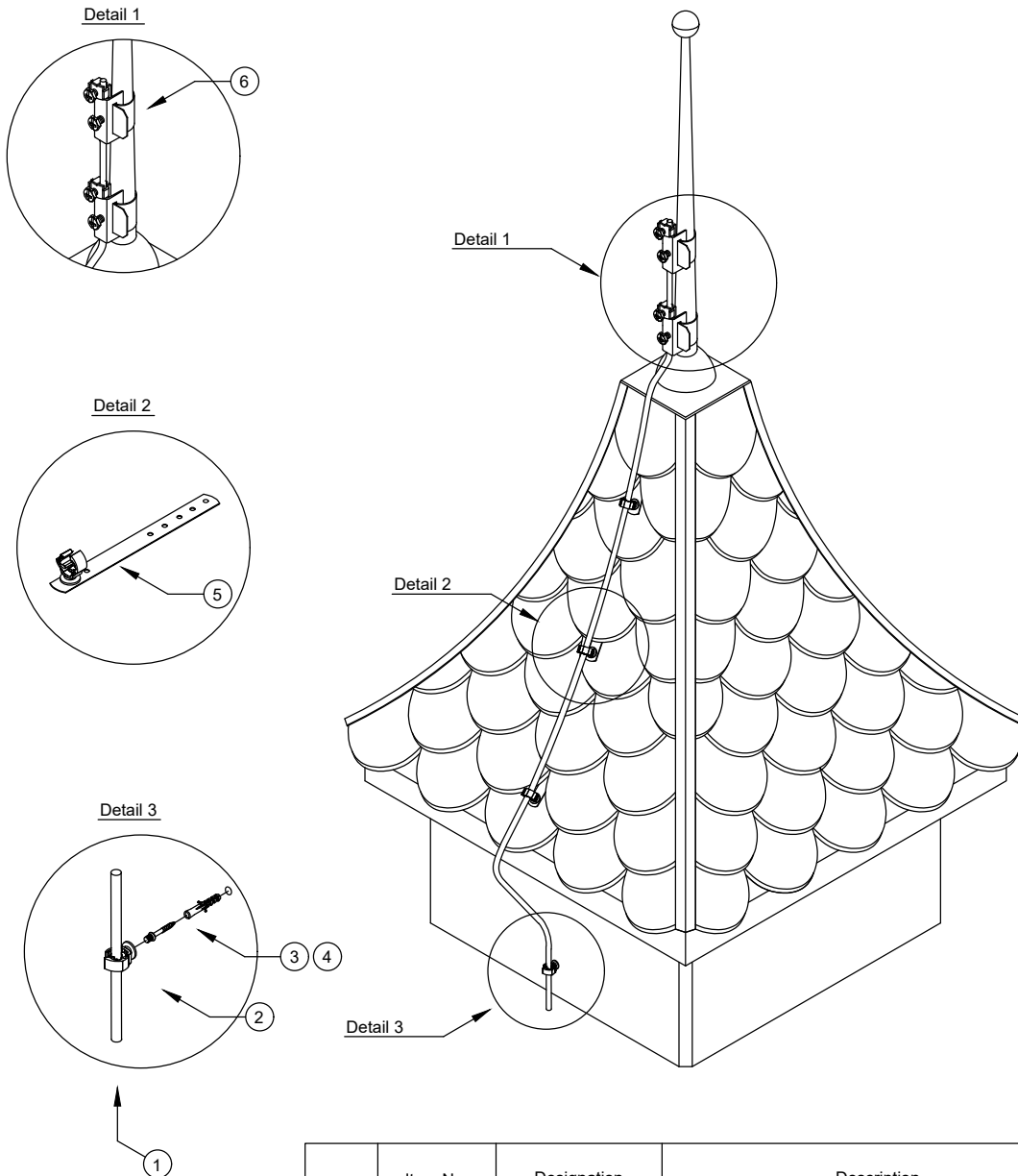
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5202515	132 K-VA	Roof conductor holder for ridge tiles	
3	5215668	157 IK-VA	Roof conductor holder for tiled roofs, angled	
4	5311519	249 8-10 ALU	Vario quick connector	
5	5102138	303 DIN-1 1/4	Pipe clamp	
6	5304164	5001 N-FT	Connector, Rd 8-10 mm with pressure trough	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.23	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.			
Creator:		Comment: Lightning protection of weather vane. Connection to the lightning protection grid.			
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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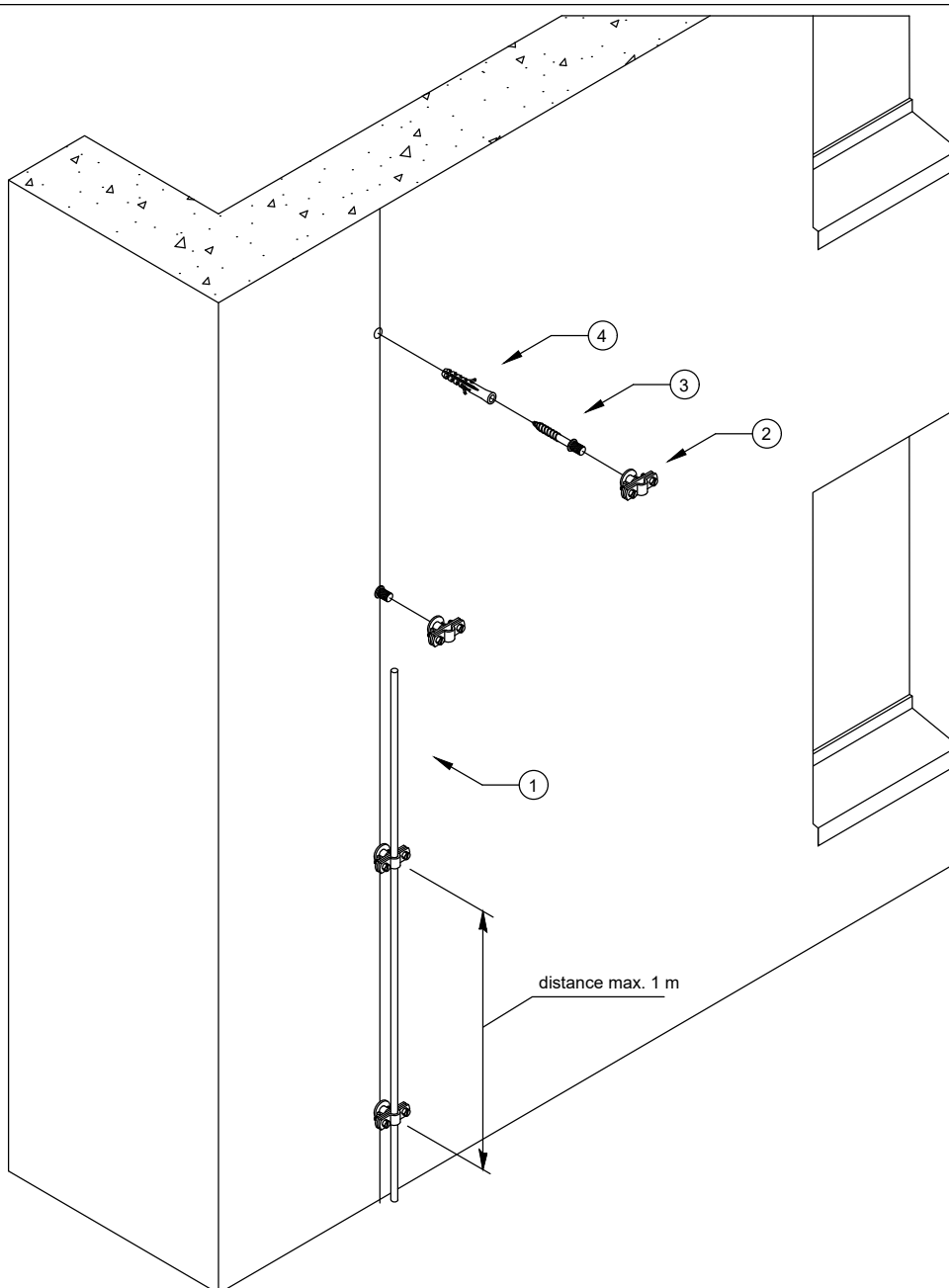
### 3 External lightning protection systems for pitched roofs




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5207444	177 20 M8	Universal cable bracket Rd 8-10 mm	
3	3133320	985 M8 35	Screw-in anchor with M8 thread	
4	2349086	910 N 8x40 GRW	Angler spreading anchor	
5	5215277	157 NB-VA	Roof conductor holder for tiled and slated roofs,	
6	5057523	927 2	Earthing pipe clamp VA	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T3.24	Project No.:
Date:	Name:	Description: The external lightning protection system for pitched roof.  Comment: Lightning protection for the pyramidal roof. Using the spire as a natural lightning interception rod.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

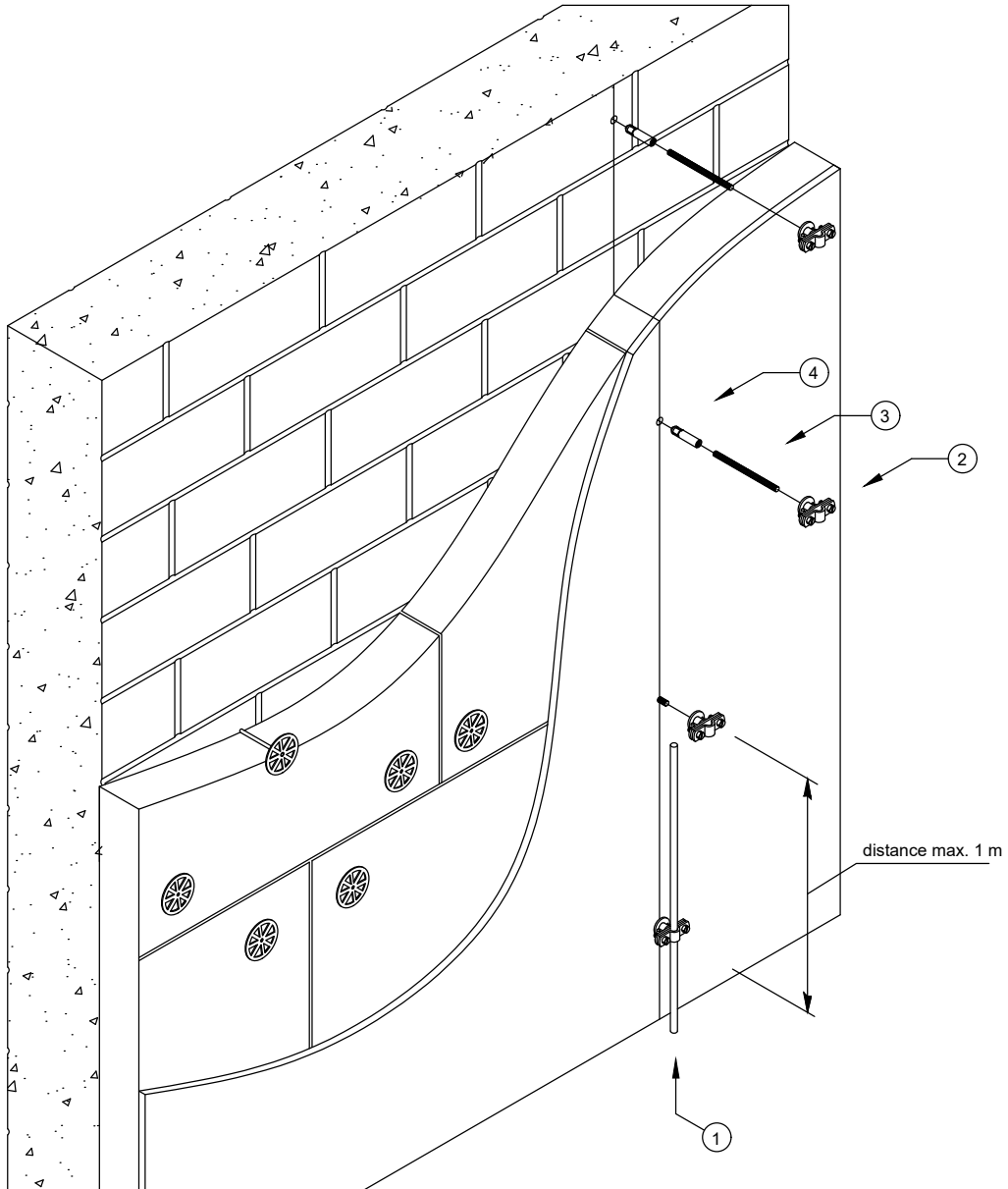
#### 4 Down-conductors





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5229960	113 Z8-10	Cable bracket with crossbar Rd 8 -10 mm	
3	3133230	985 M8 35	Screw-in anchor with M8 thread	
4	2349086	910 N 8x40 GRW	Angler spreading anchor	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.01	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system Down-conductors			
Editor:		Comment:			
Status:		Laying a round conductor on the wall surface			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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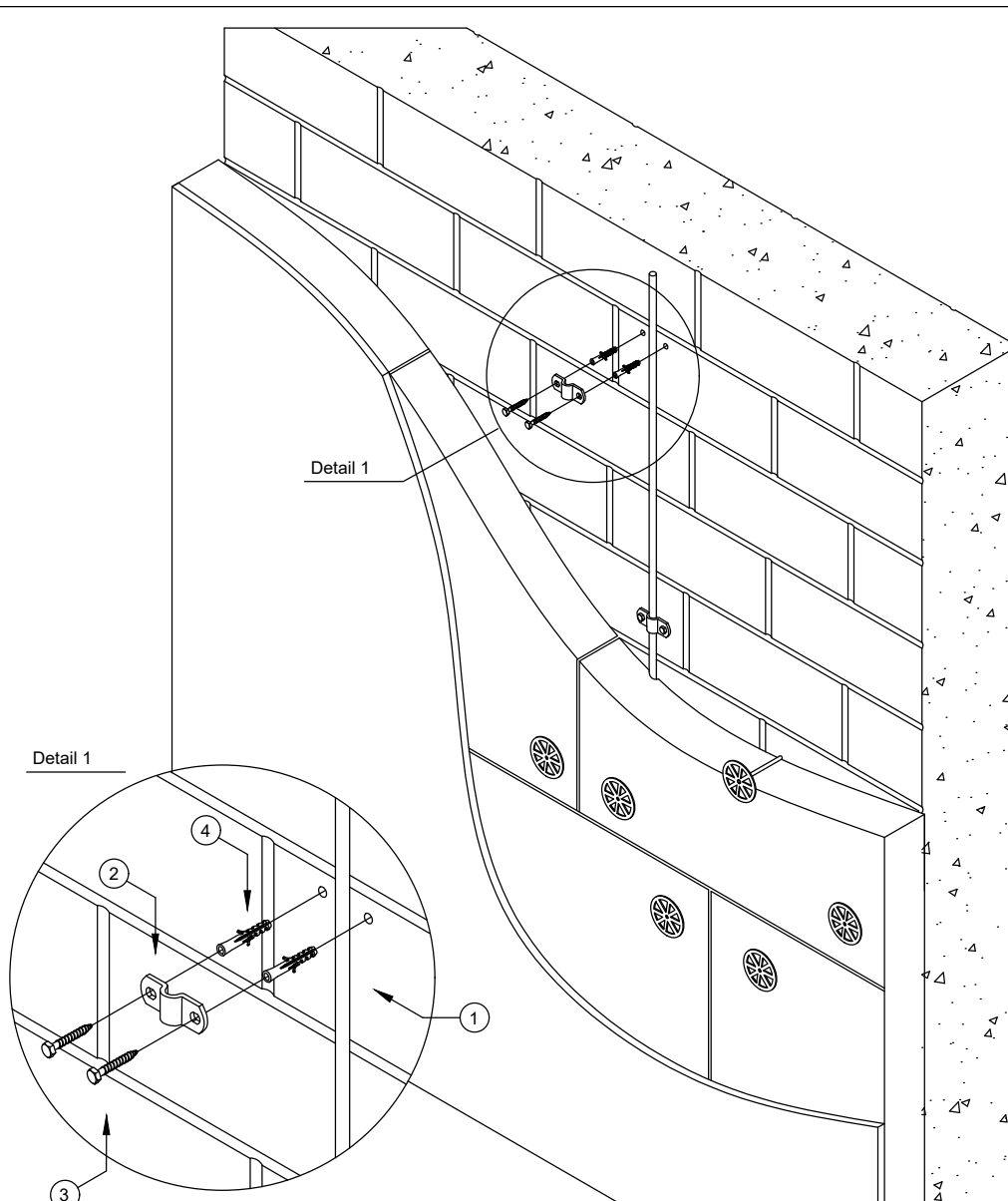
## 4 Down-conductors





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5229960	113 Z8-10	Cable bracket with crossbar Rd 8 -10 mm	
3	3141128	TR M8 1M G	Threaded rod G 1000	
4	3492910	E M 8x40	Drop-in anchor E	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.02	Project No.:
Date:	Name:	Description: <b>The external lightning protection system Down-conductors</b>			
Creator:		Comment: Laying a round conductor over an insulated wall surface.			
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		Sheet: of:

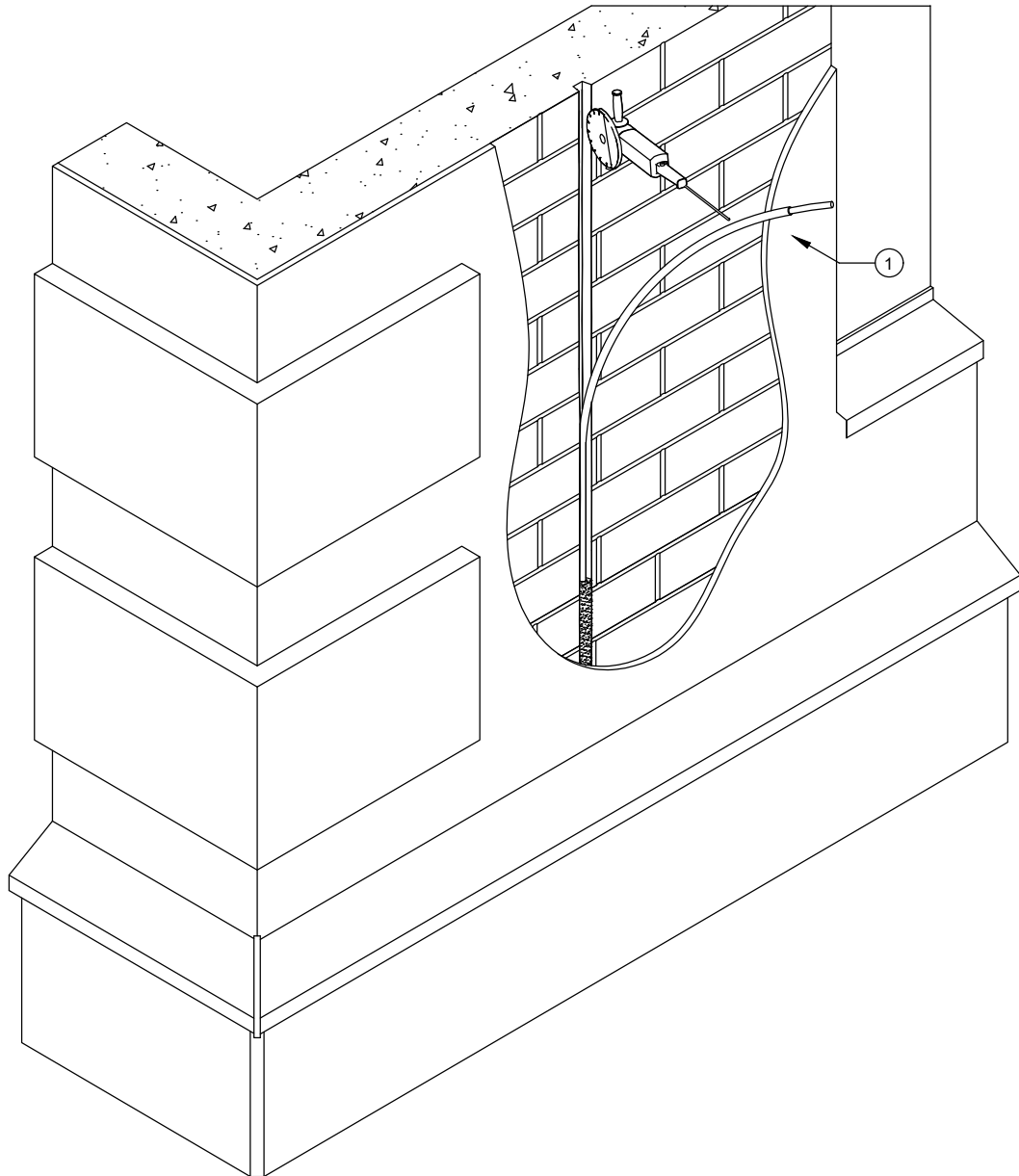
#### 4 Down-conductors




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5228123	156 K 8-10 ST	Crossbar for Rd 8-10 mm	
3	3188043	HHWS 6x40 G	Hexagonal wood screw DIN 571	
4	2349086	910 N 8x40 GRW	Angler spreading anchor	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.03	Project No.:
Date:	Name:	Description: The external lightning protection system Down-conductors			
Creator:		Comment: Laying a round conductor over a wall surface under heat insulation.			
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		Sheet: of:

**4 Down-conductors**

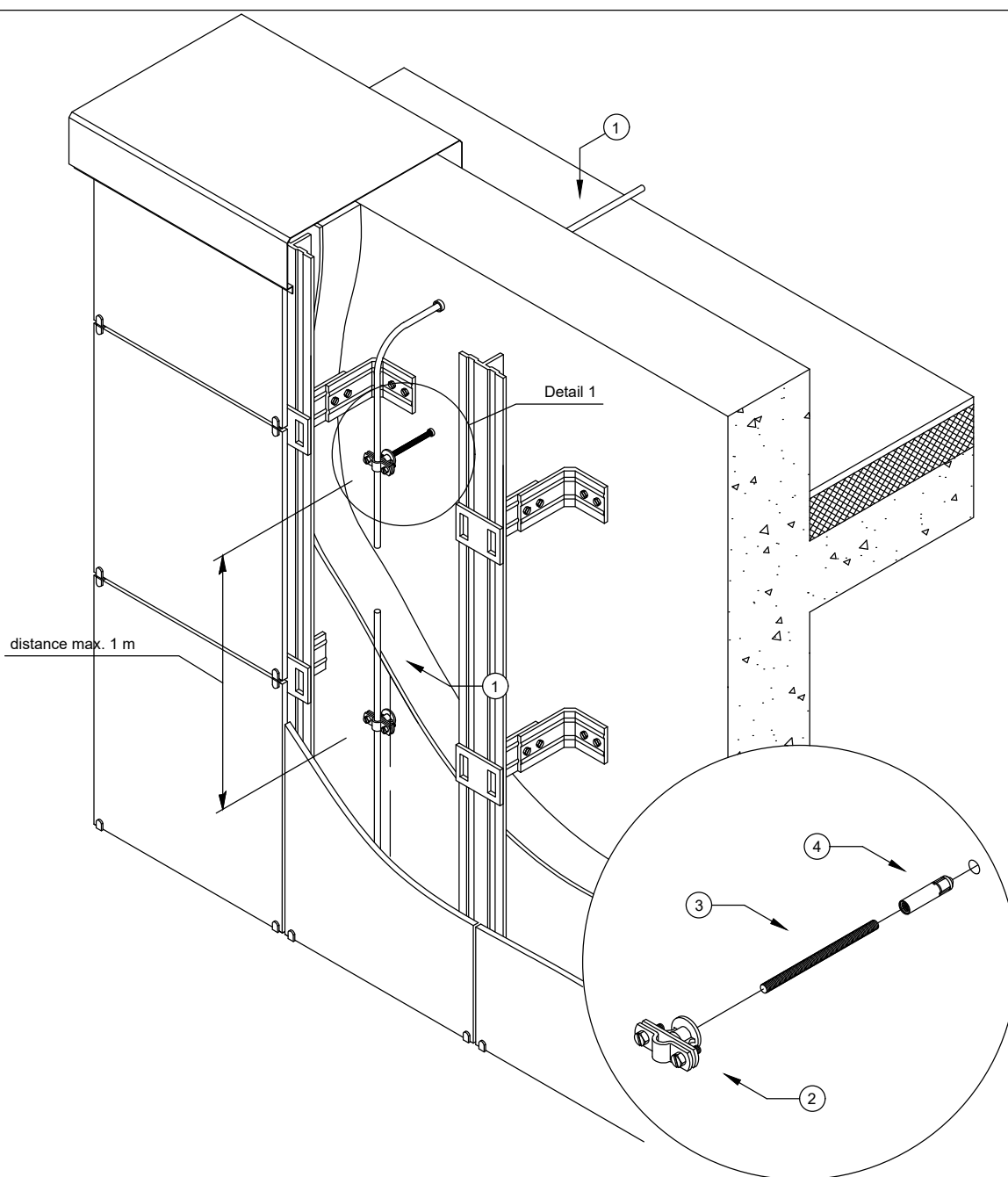


	Item No.	Designation	Description	Q-ty
1	5021332	RD 8-PVC	Round conductor, aluminium with PVC sheathing	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.04	Project No.:
Date:	Name:	Description: The external lightning protection system Down-conductors			
Creator:		Comment: Laying a round conductor in a groove under a building plaster			
Editor:					
Status:					
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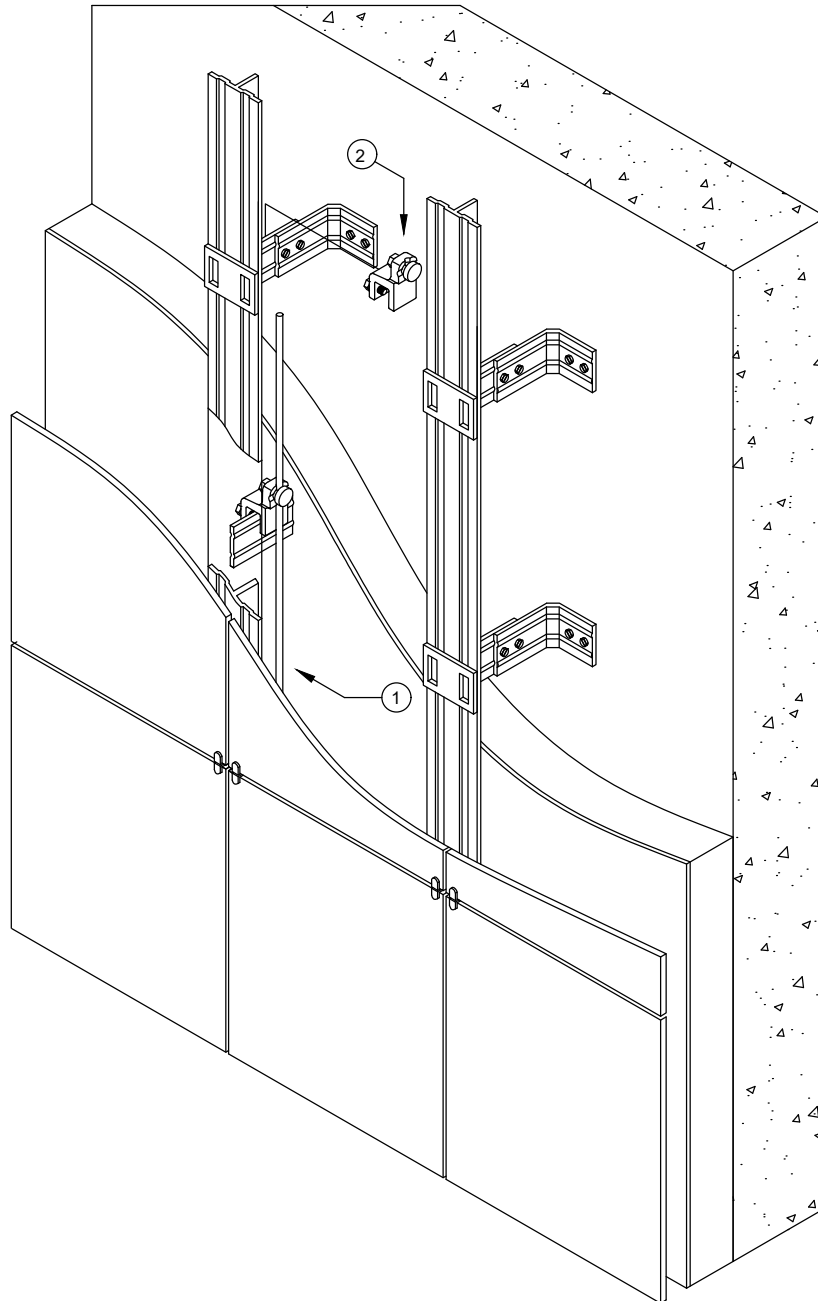
## 4 Down-conductors




	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5229960	113 Z8-10	Cable bracket with crossbar Rd 8 -10 mm	
3	3141128	TR M8 1M G	Threaded rod G 1000	
4	3492910	E M 8x40	Drop-in anchor E	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.05	Project No.:
Date:	Name:	Description: The external lightning protection system Down-conductors			
Creator:		Comment: Laying the round conductor behind the cladding of the ventilated facade. Exit to the roof surface.			
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:
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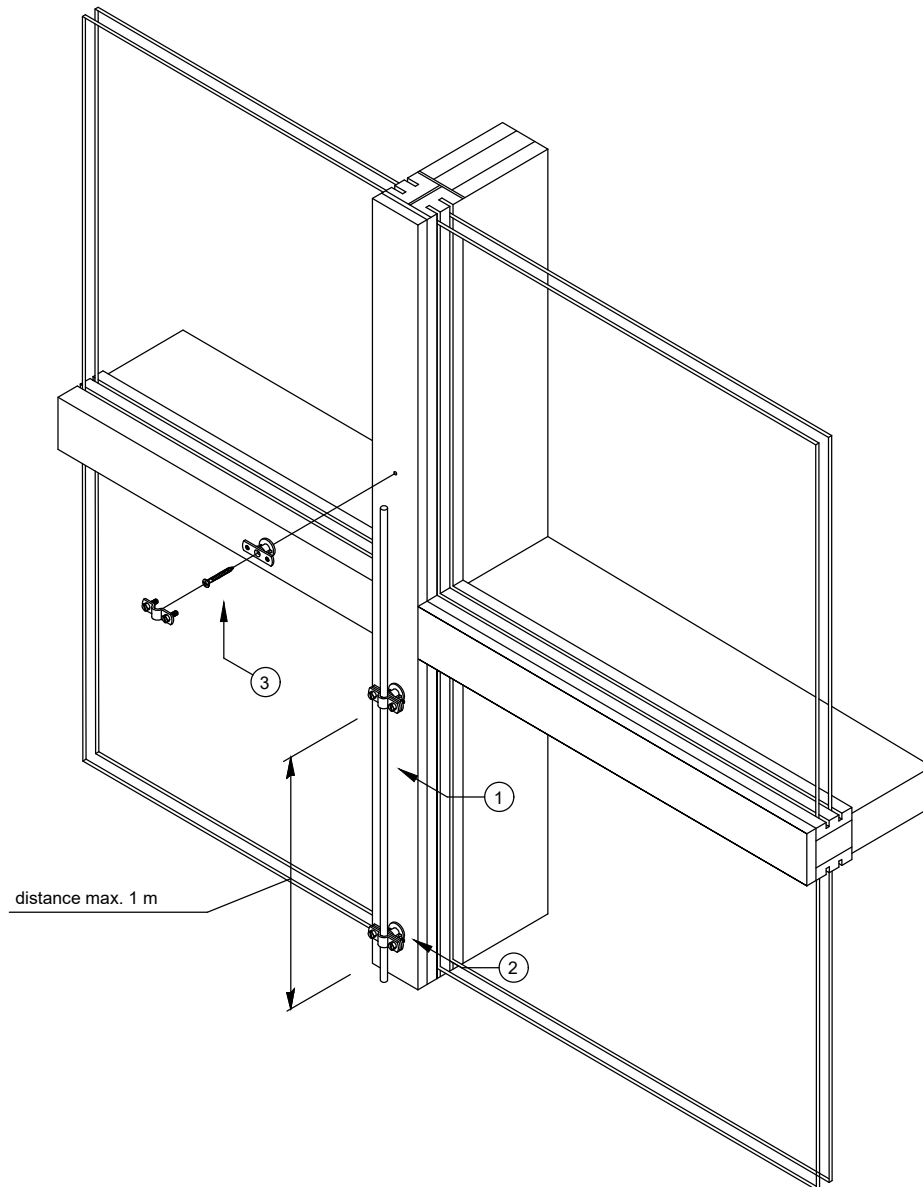
#### 4 Down-conductors




	Item No.	Designation	Description	Q-ty
1	5021332	RD 8-PVC	Round conductor, aluminium with PVC sheathing	
2	5304504	5004 DIN-FT 20	Folding and construction clamp, 10-20 mm	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.06	Project No.:
Date:	Name:	Description: The external lightning protection system Down-conductors  Comment: Laying the round conductor behind the cladding of the ventilated facade. Mounting to brackets.			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

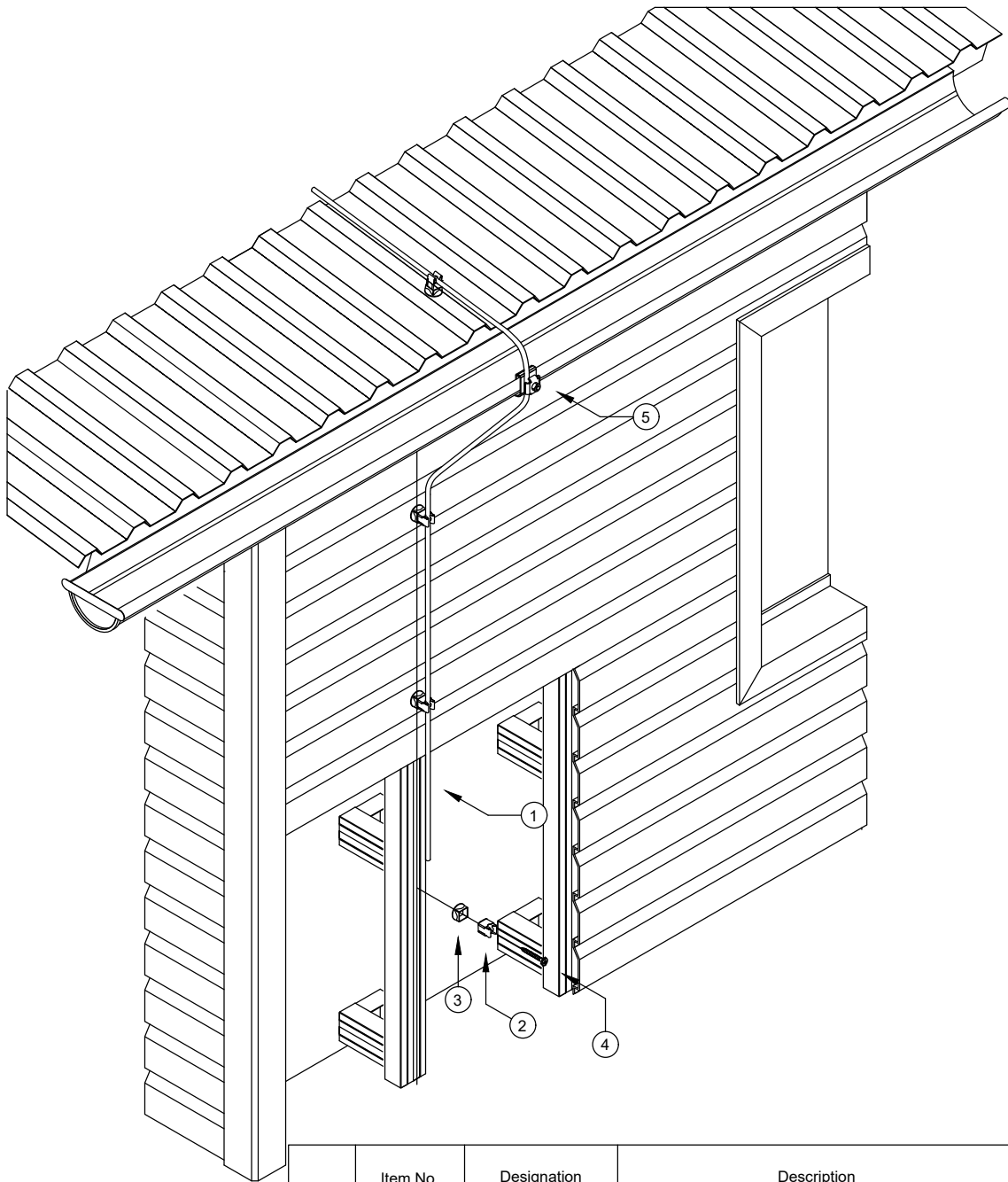
## 4 Down-conductors





	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5229960	113 Z8-10	Cable bracket with crossbar Rd 8 -10 mm	
3	3192644	4759 6.0x60	Sprint screw, with Philips slot	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.07	Project No.:
Date:	Name:	Description: The external lightning protection system Down-conductors			
Creator:		Comment: Laying the round conductor on the glass facade. Mounting to a metal frame.			
Editor:					
Status:					
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	— — —			<b>BETTERMANN</b>	Sheet size:
Ind.	Amendment typical	Date:	Name:		Sheet: of:

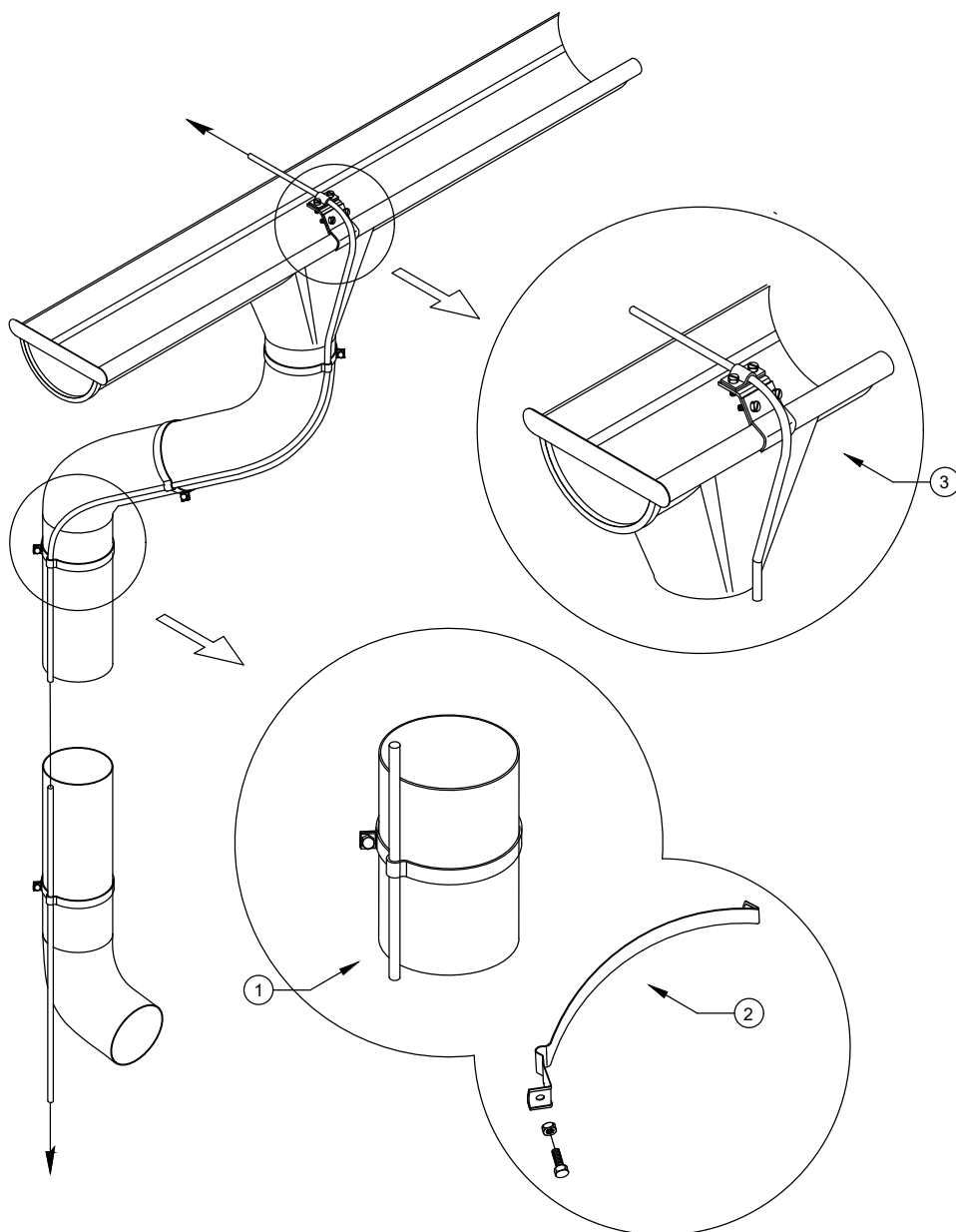
## 4 Down-conductors



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5207347	177 20 VA M8	Screwless cable bracket for Rd 8 mm, through-way Ø 7 mm	
3	5207371	177 U	Washer for cable bracket	
4	3195635	4758 5.0x30	Golden sprint, with Philips screw	
5	5316450	RK-FIX	Gutter clamp RK-FIX	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.08	Project No.:
Date:	Name:	Description: The external lightning protection system Down-conductors			
Creator:		Comment: Laying the round conductor on the siding. Fastening to the rack profiles of the frame.			
Editor:					
Status:					
	— — —				Scale:
	— — —				Sheet size:
Ind.	Amendment typical	Date:	Name:	Sheet:	of:

4 Down-conductors

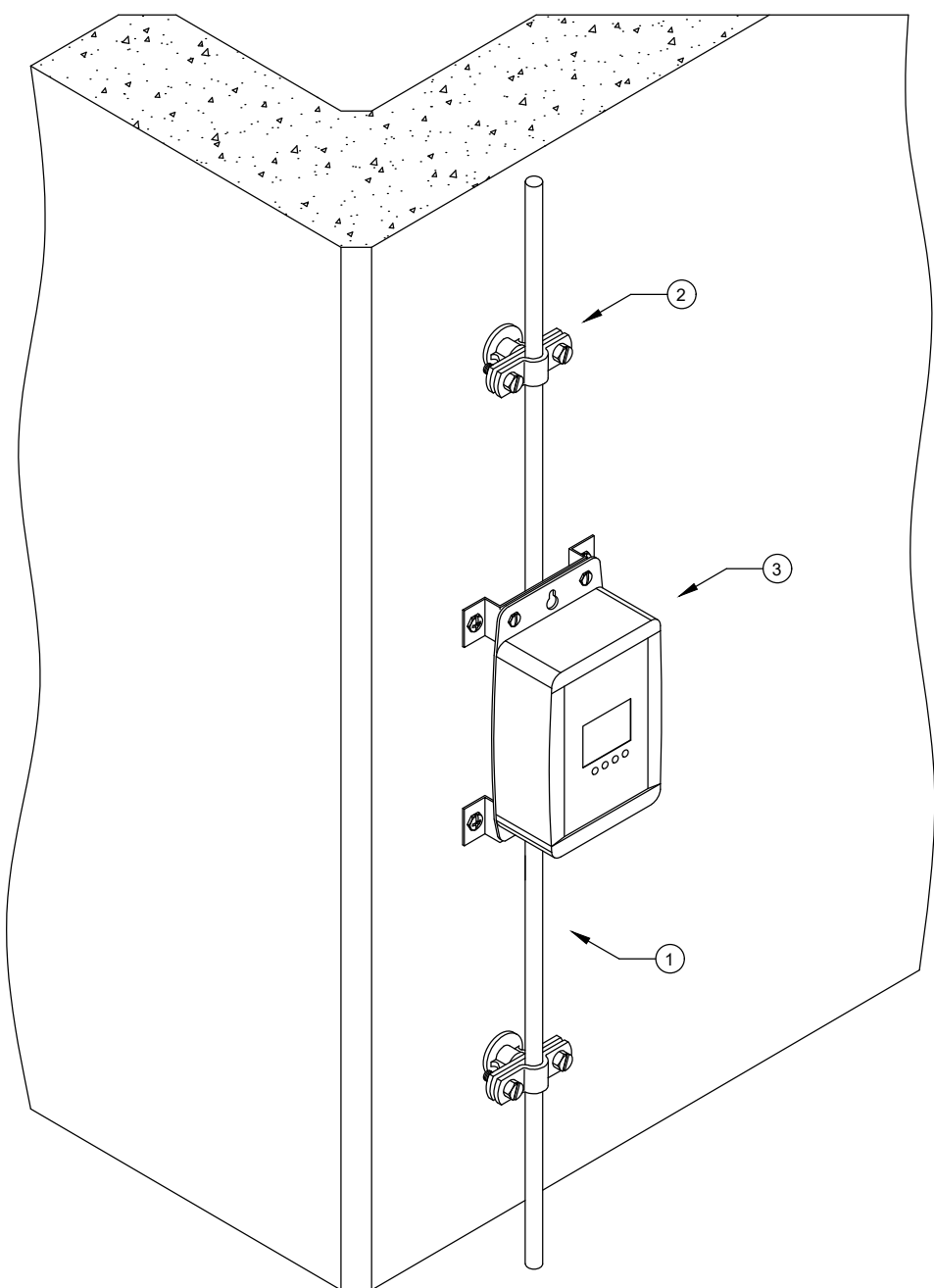


	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5351375	301 S-AL-120	Downspout clamp for routing Rd 8-10 mm behind pipe	
3	5316014	262	Roof gutter clamp for all bead thicknesses	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.09	Project No.:
Date:	Name:	Description: The external lightning protection system Down-conductors			
Creator:		Comment: Laying the round conductor along a gutter pipe.			
Editor:					
Status:					
	---			<b>OBO</b>	Scale:
	---			<b>BETTERMANN</b>	Sheet size:
Ind.	Amendment typical	Date:	Name:		Sheet: of:



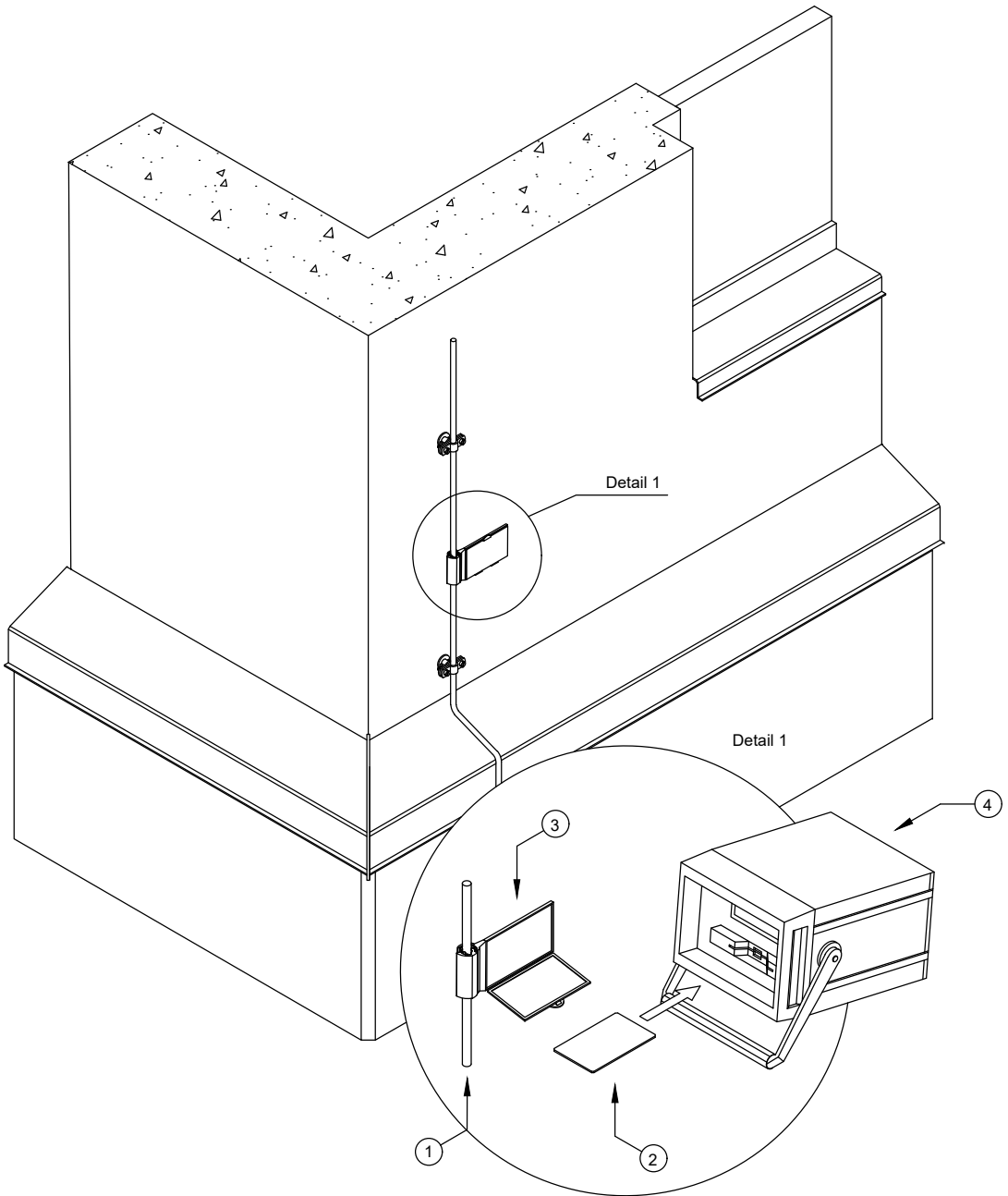
**5 Lightning strike counter**



	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5230322	113 B-Z-HD	Cable bracket with crossbar, wood screw, plastic anchor	
3	5091722	LSC I+II	Lightning strike counter	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.10	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system Down-conductors			
Editor:		Comment:			
Status:		Installation of the lightning strikes counter on a down conductor			
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
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**5 Lightning strike counter**

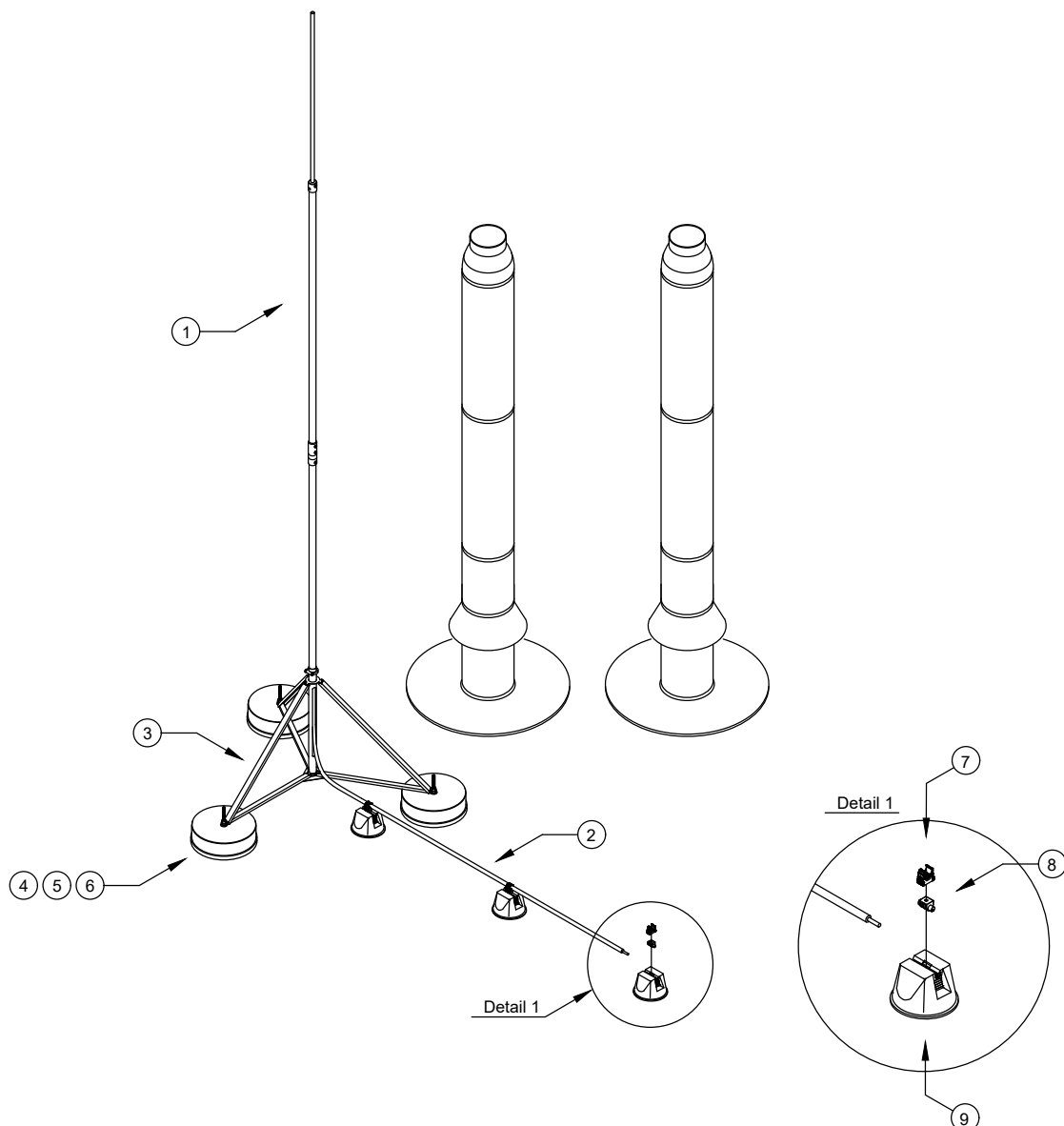


	Item No.	Designation	Description	Q-ty
1	5021294	RD 8-ALU-T	Round conductor, aluminium	
2	5091438	PCS	Magnetic card PCS	
3	5091527	PCS-H	Magnetic card holder PCS-H	
4	5091683	PCS-CS-D	Card reader PCS-CS..	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T4.11	Project No.:
Date:	Name:	Description:			
Creator:		The external lightning protection system Down-conductors			
Editor:		Comment:			
Status:		Installation of a magnetic card for recording of lightning strikes on the down conductor.			
	— — —			<b>OBO</b>	Scale:
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Ind.	Amendment typical	Date:	Name:		of:



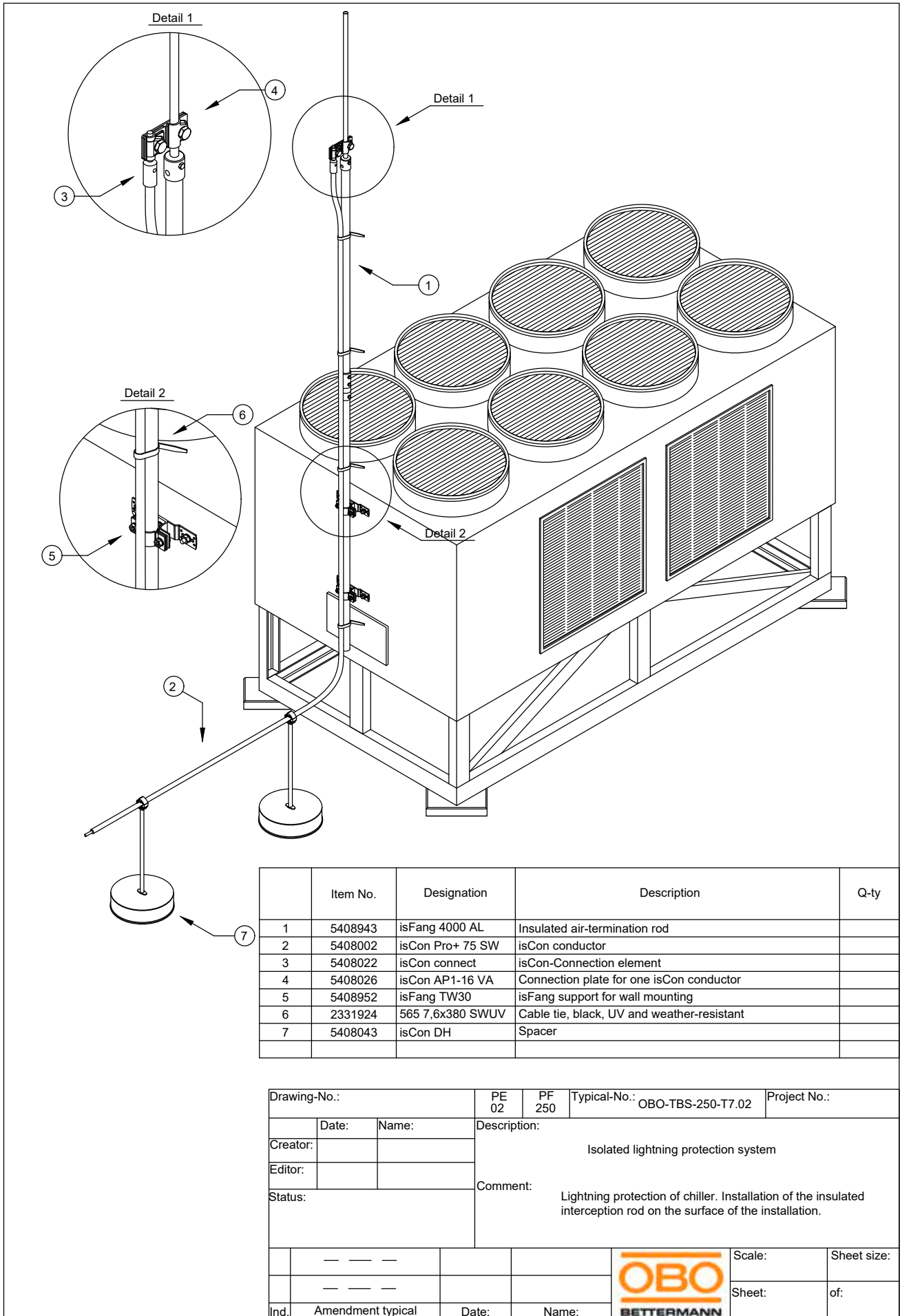
## 6 Isolated lightning protection systems



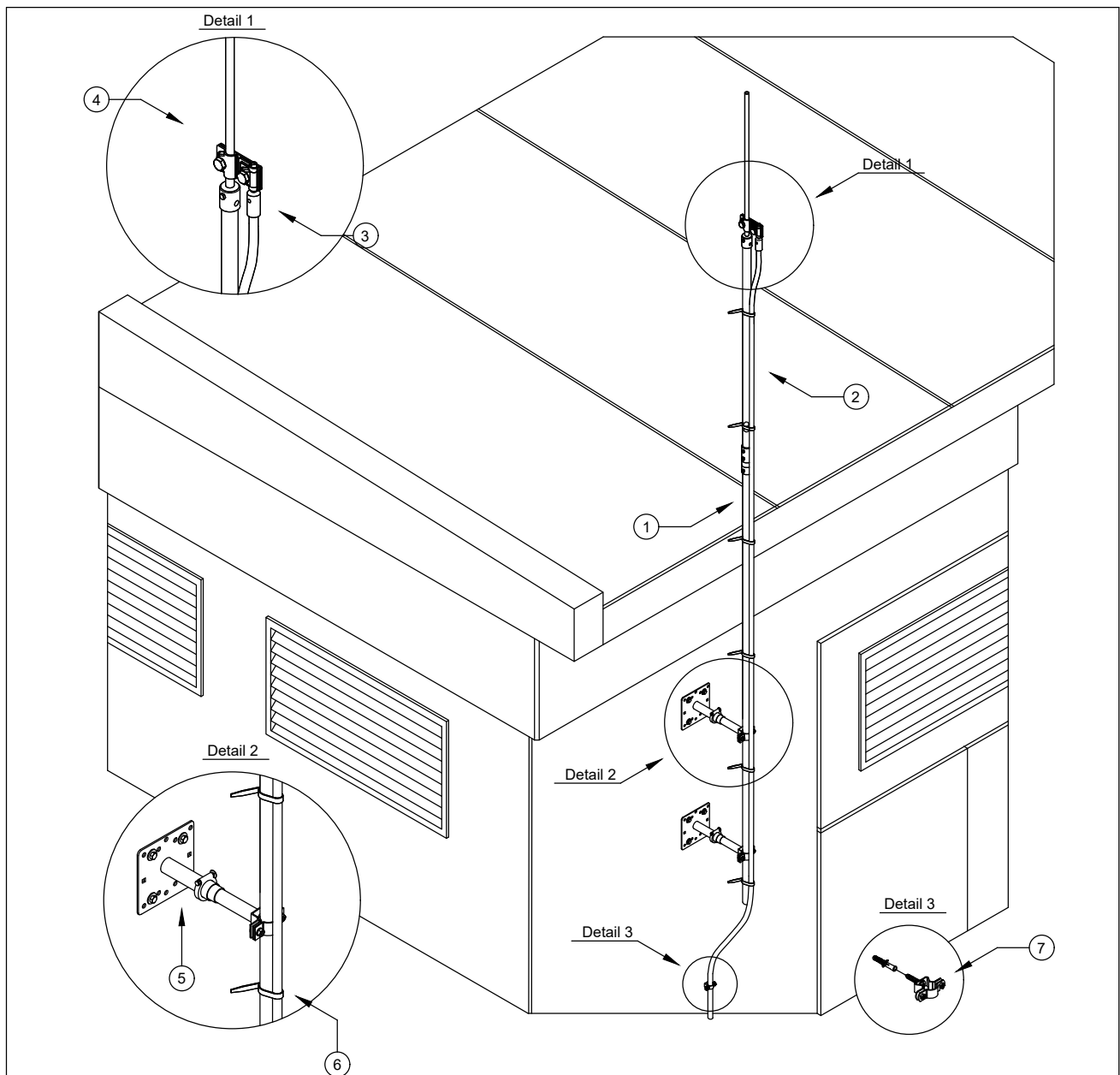
	Item No.	Designation	Description	Q-ty
1	5408938	isFang IN-A 4000	isFang, insulated air-termination rod for inner-routed isCon	
2	5408002	isCon Pro+ 75 SW	isCon conductor	
3	5408930	isFang 3B-100-A	isFang air-termination rod stand with side exit	
4	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg	
5	5403238	F-FIX-B16 3B	Base for FangFix system 16 kg for mounting the isFang tripod	
6	5408971	isFang 3B-G1	isFang-3B threaded rod	
7	2153726	M-Quick M25 LGR	Multi-Quick clip	
8	5218882	165 MBG UH	Universal flat conductor adapter for roof conductor holder	
9	5218700	165 MBG 8-10	Roof conductor holder for flat roofs	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.01	Project No.:
Date:	Name:	Description: Isolated lightning protection system			
Creator:		Comment: Lightning protection for flammable gas ejection pipes (EX-areas). Installation the insulated interception rod on a tripod.			
Editor:					
Status:					
	— — —				Scale:
	— — —				Sheet size:
Ind.	Amendment typical	Date:	Name:	Sheet:	of:


## 6 Isolated lightning protection systems



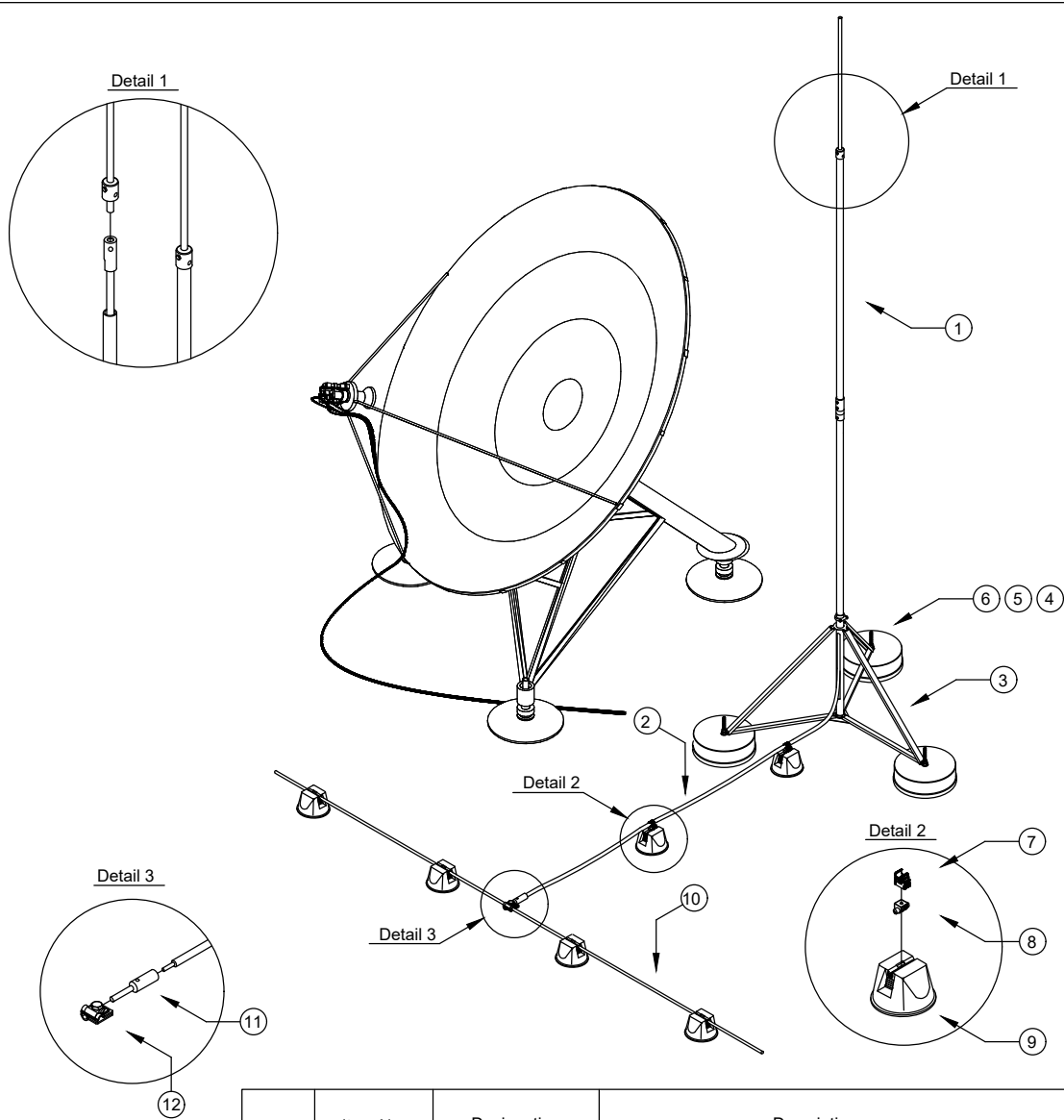
## 6 Isolated lightning protection systems




	Item No.	Designation	Description	Q-ty
	1	5408943 isFang 4000 AL	Insulated air-termination rod	
	2	5408002 isCon Pro+ 75 SW	isCon conductor	
	3	5408022 isCon connect	isCon-Connection element	
	4	5408026 isCon AP1-16 VA	Connection plate for one isCon conductor	
	5	5408954 isFang TW200	isFang support for wall mounting	
	6	2331924 565 7,6x380 SWUV	Cable tie, black, UV and weather-resistant	
	7	5408056 isCon H VA	VA cable bracket for isCon conductor	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.03	Project No.:
Date:	Name:	Description:			
Creator:		Isolated lightning protection system			
Editor:		Comment:			
Status:		Lightning protection of a modular power plant. Installation of insulated interception rod on the wall of an object.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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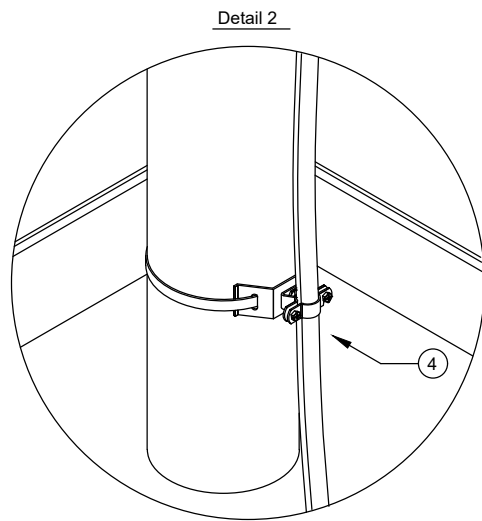
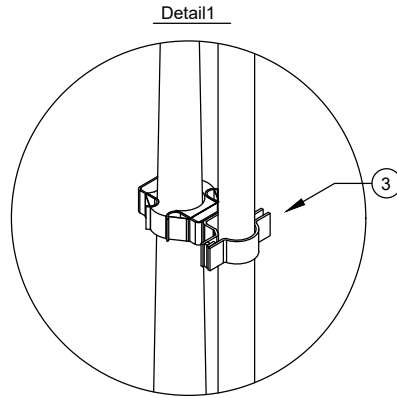
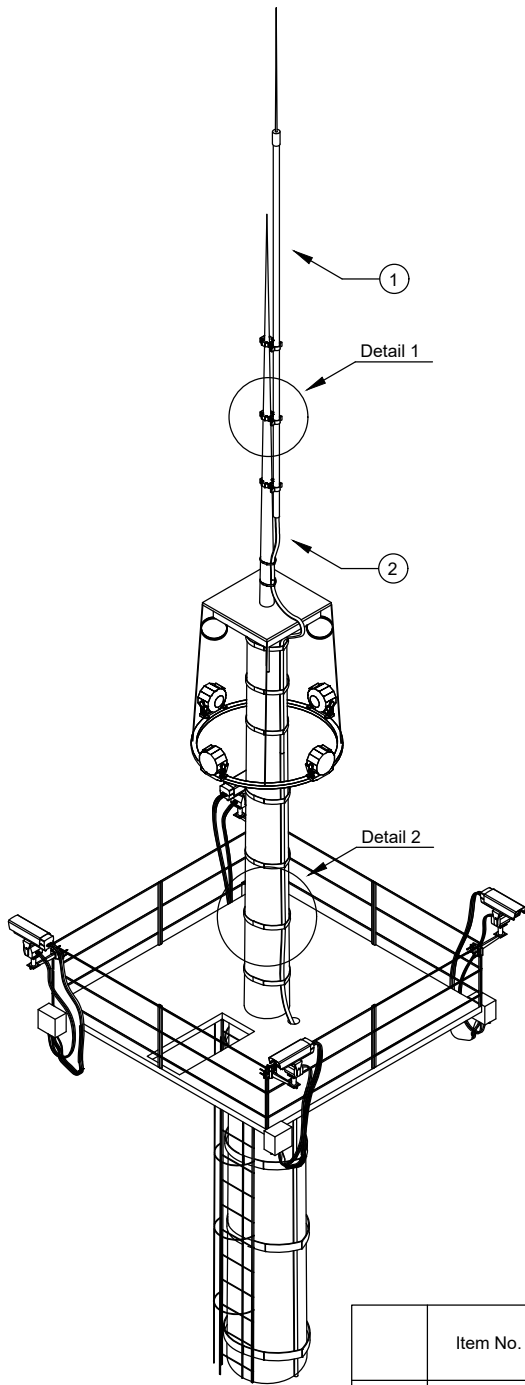
## 6 Isolated lightning protection systems




	Item No.	Designation	Description	Q-ty
	1	5408938	isFang IN-A 4000	isFang, insulated air-termination rod for inner-routed isCon
	2	5408002	isCon Pro+ 75 SW	isCon conductor
	3	5408930	isFang 3B-100-A	isFang air-termination rod stand with side exit
	4	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg
	5	5403238	F-FIX-B16 3B	Base for FangFix system 16 kg for mounting the isFang tripod
	6	5408971	isFang 3B-G1	isFang-3B threaded rod
	7	2153726	M-Quick M25 LGR	Multi-Quick clip
	8	5218882	165 MBG UH	Universal flat conductor adapter for roof conductor holder
	9	5218700	165 MBG 8-10	Roof conductor holder for flat roofs
	10	5021294	RD 8 ALU-T	Round conductor, aluminium
	11	5408022	isCon connect	isCon-connection element
	12	5311519	249 8-10 ALU	Vario quick connector

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.04	Project No.:
Date:	Name:	Description:			
Creator:		Isolated lightning protection system			
Editor:		Comment:			
Status:		Lightning protection of the satellite antenna. Installation of insulated interception rod on a tripod.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
					Sheet: of:

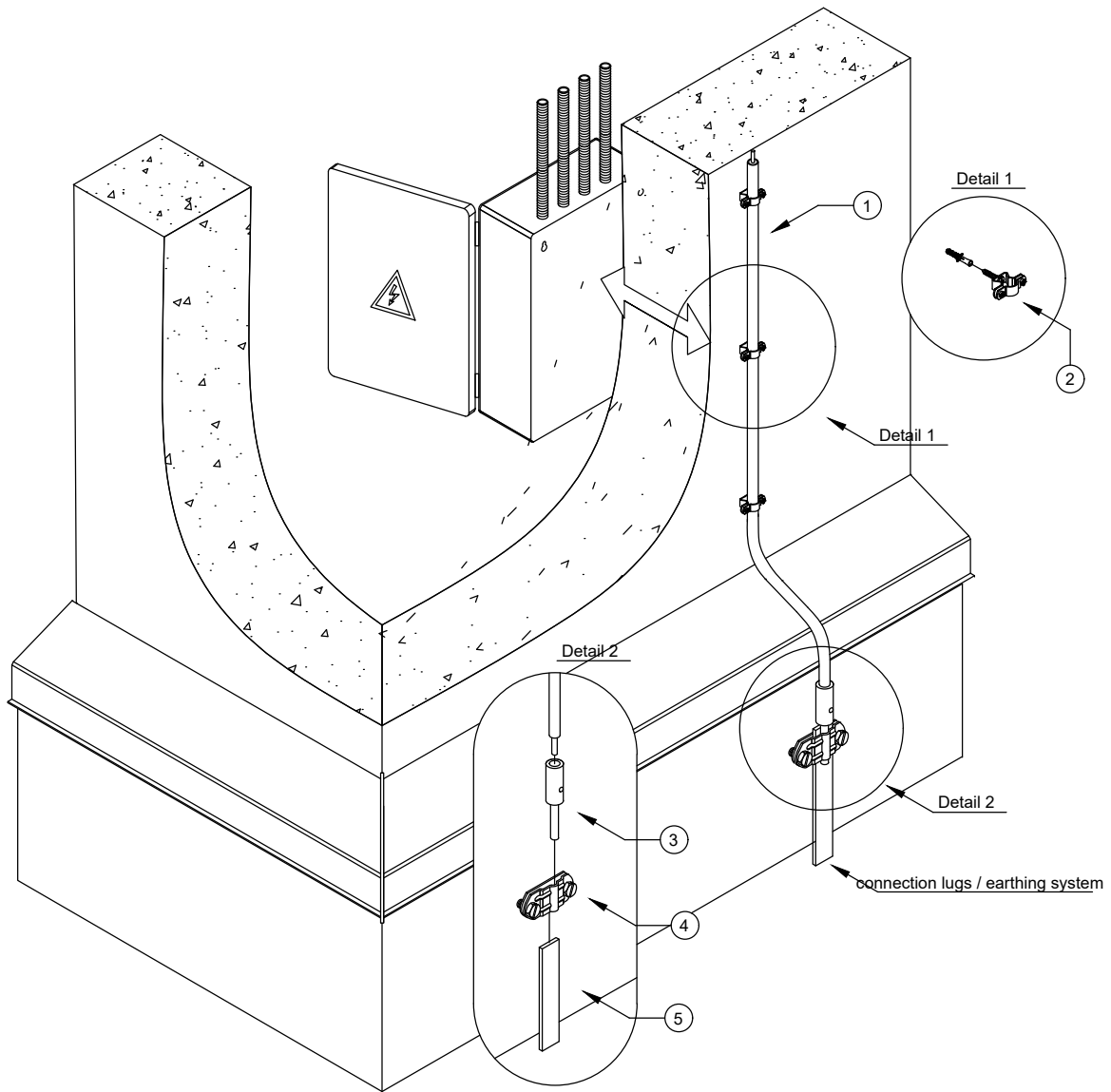
**6 Isolated lightning protection systems**




	Item No.	Designation	Description	Q-ty
1	5408934	isFang IN 4000	Insulated air-termination rod	
2	5408002	isCon Pro+ 75 SW	isCon conductor	
3	5408956	isFang TR100	isFang support for pipe mounting	
4	5408052	isCon HS VA	VA cable bracket with tightening strap	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.05	Project No.:
Date:	Name:	Description:			
Creator:		Isolated lightning protection system			
Editor:		Comment:			
Status:		Lightning protection for the floodlight mast. Installation of insulated interception rod to the spire.			
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
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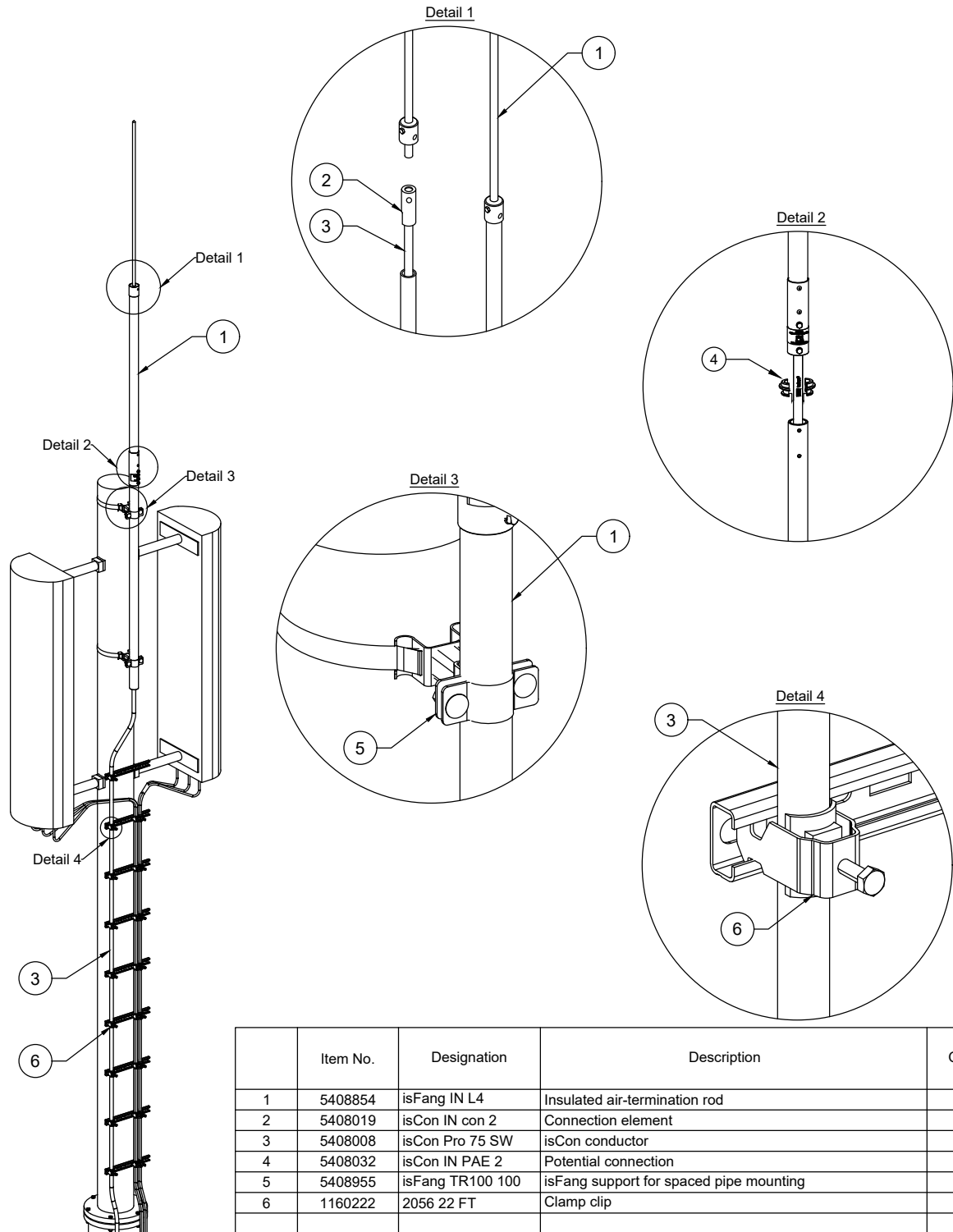
## 6 Isolated lightning protection systems



	Item No.	Designation	Description	Q-ty
1	5408002	isCon Pro+ 75 SW	isCon conductor	
2	5408056	isCon H VA	VA cable bracket for isCon conductor	
3	5408022	isCon connect	isCon-Connection element	
4	5336457	233 A VA	Separating piece for Rd 8-10 and FL 30-40 mm	
5	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.06	Project No.:
Date:	Name:	Description:			
Creator:		Isolated lightning protection system			
Editor:		Comment:			
Status:		Laying isCon conductor on the wall of a building to an earthing system.			
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
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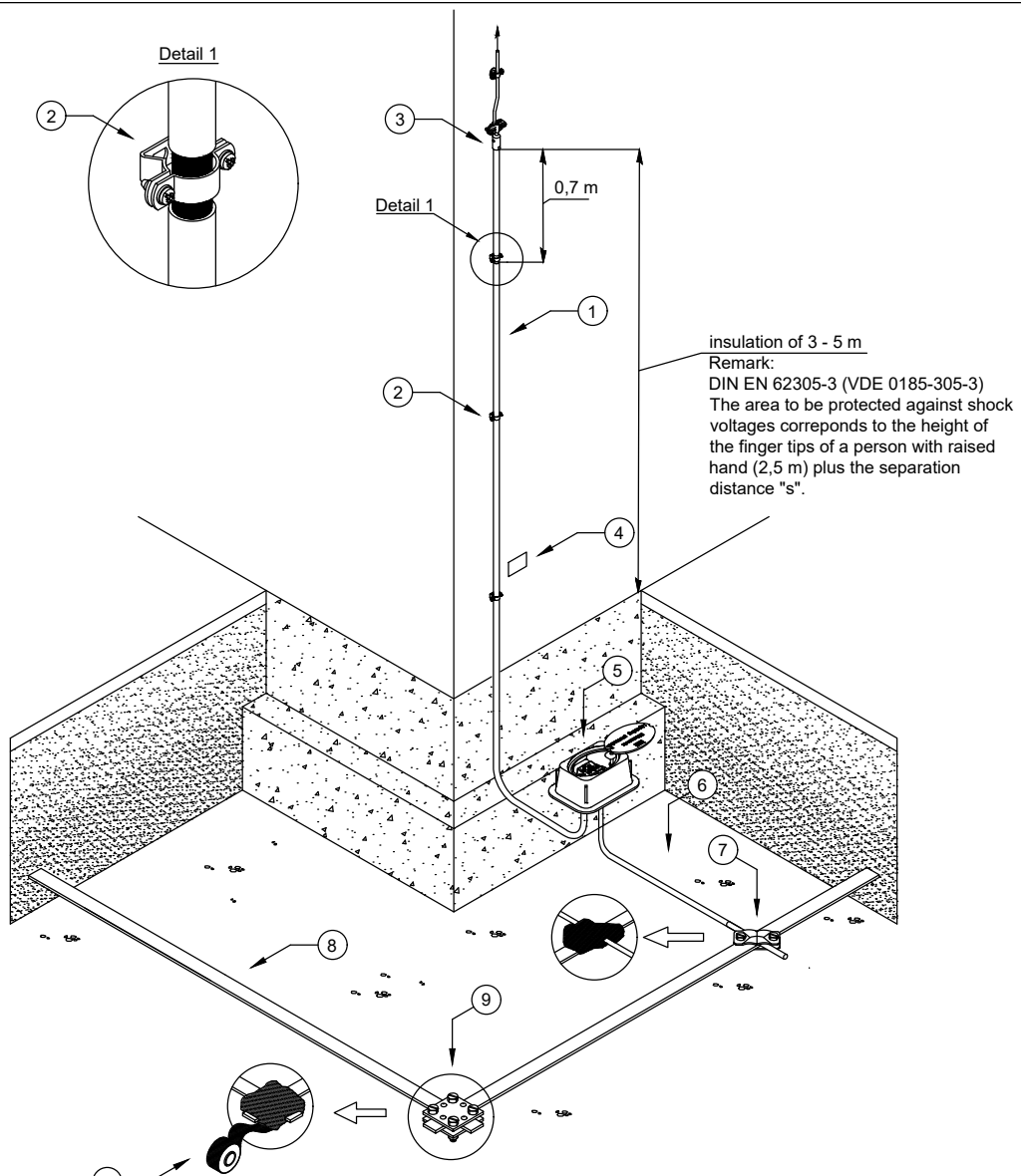
## 6 Isolated lightning protection systems



	Item No.	Designation	Description	Q-ty
1	5408854	isFang IN L4	Insulated air-termination rod	
2	5408019	isCon IN con 2	Connection element	
3	5408008	isCon Pro 75 SW	isCon conductor	
4	5408032	isCon IN PAE 2	Potential connection	
5	5408955	isFang TR100 100	isFang support for spaced pipe mounting	
6	1160222	2056 22 FT	Clamp clip	

Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.07	Project No.:
Date:	Name:	Description: Isolated lightning protection system			
Creator:		Comment: Lightning protection of mobile phone antenna			
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

## 6 Isolated lightning protection systems

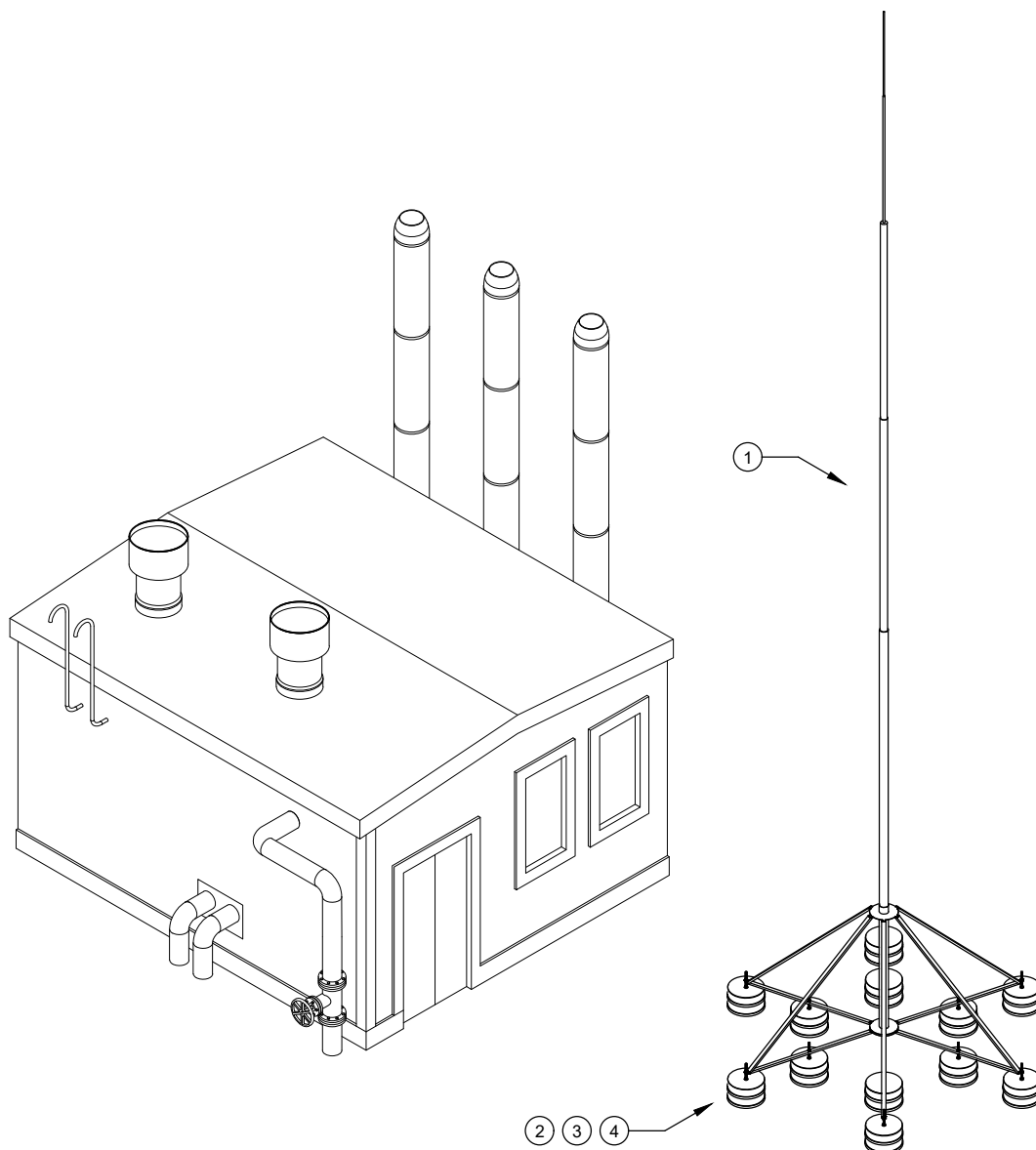


	Item No.	Designation	Description	Q-ty
1	5407997	isCon Pro+ 75 GR	isCon conductor, professional light grey	
2	5408056	isCon H VA	VA cable bracket for isCon conductor	
3	5408022	isCon connect	isCon-connection element	
4	5408059	isCon HWS EN	Information panel	
5	5106003	5700 SP	Inspection pit with integrated separation piece	
6	5021642	RD 10 V4A	Round conductor, stainless steel	
7	5312925	250 V4A	Cross connector for flat and round conductors	
8	5018706	5052 V4A 30x3,5	Flat conductor, stainless steel	
9	5314659	256 A-DIN 30 V4A	DIN cross-connector for flat conductor	
10	2360055	356 50	Plastic corrosion protection strip	



Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.08	Project No.:
Date:	Name:	Description:			
Creator:		Isolated lightning protection system			
Editor:		Comment:			
Status:		Laying isCon conductor on the wall of a building to an earthing system. Installation of the measuring point at a height of 3-5 m due shock voltages.			
	— — — —			OBO	Scale:
	— — — —			BETTERMANN	Sheet size:
Ind.	Amendment typical	Date:	Name:		Sheet: of:



## 6 Isolated lightning protection systems

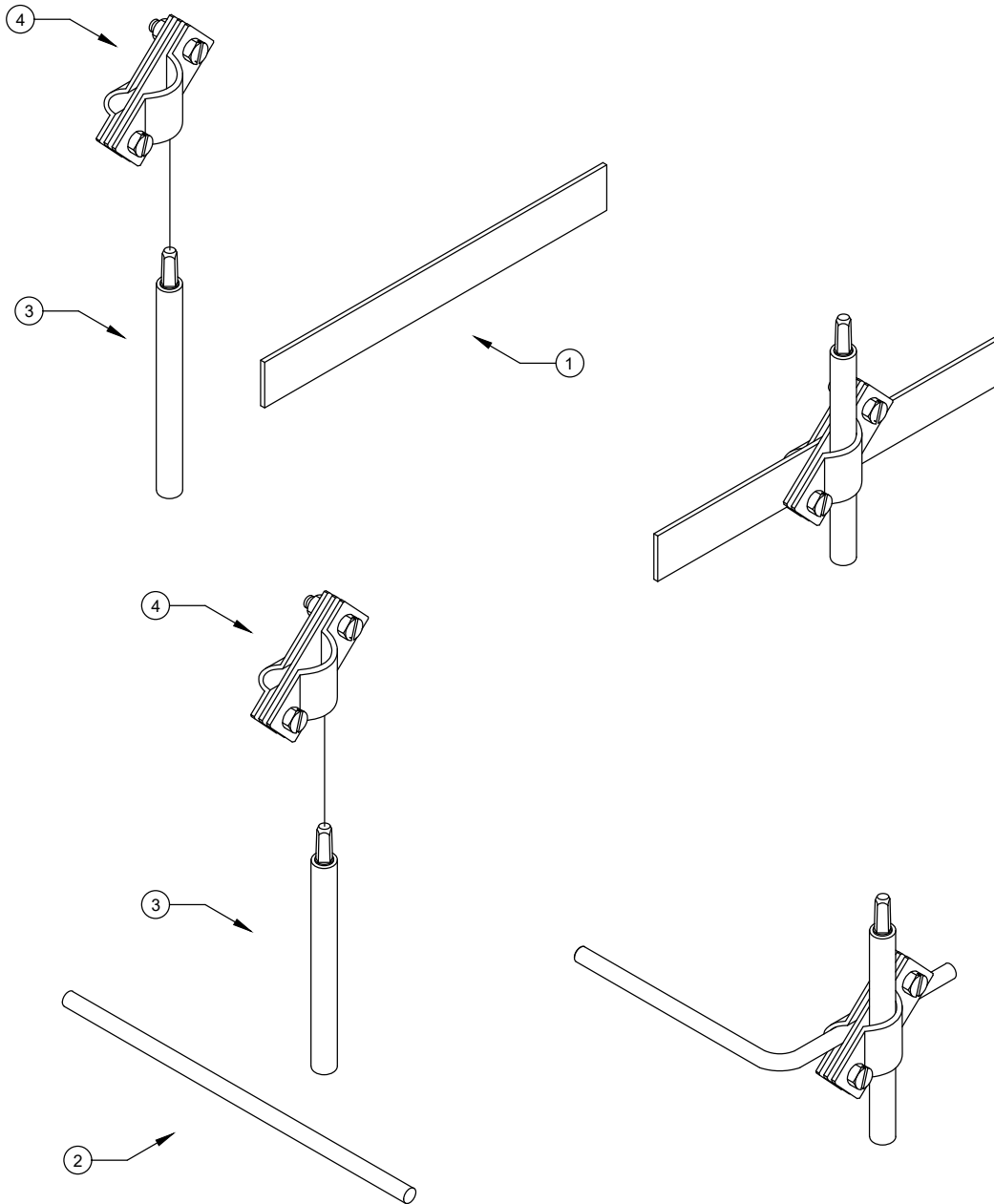


	Item No.	Designation	Description	Q-ty
1	5400810	irod 10	10 m air-termination rod with 6 legged	
2	5403227	F-FIX-S16	Concrete block for FangFix-System 16 kg	
3	5403238	F-FIX-B16 3B	Base for FangFix system 16 kg	
4	5408905	isFang 3B-150	isFang-3B threaded rod	


Drawing-No.:		PE 02	PF 250	Typical-No.: OBO-TBS-250-T7.09	Project No.:
Date:	Name:	Description: Isolated lightning protection system  Comment: Lightning protection with tele interception rod systems. Installation of the Irod10 mast			
Creator:					
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		



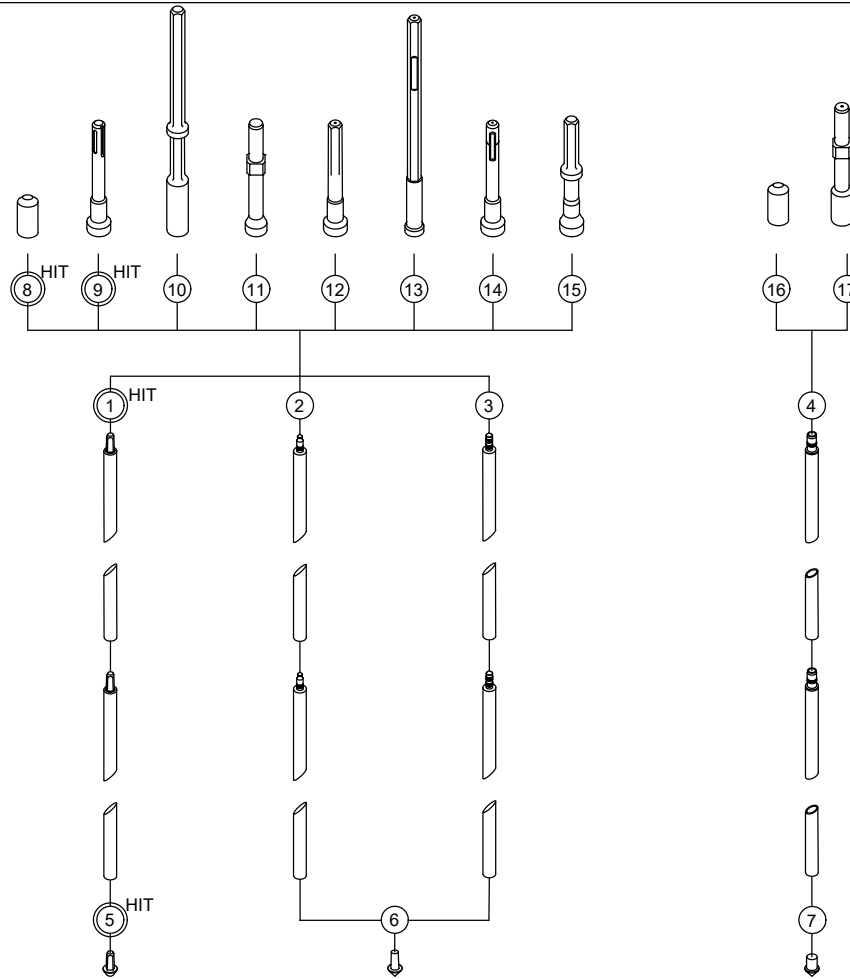
## 7 Earthing systems




	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5021103	RD 10	Round conductor, galvanised steel	
3	5000017	219 20 OMEX FT	OMEX earthing rod	
4	5001641	2760 20 FT	Connection clamp for earth rod, universal	

Drawing-No.:		PE 02	PF 200	Typical-No.:	OBO-TBS-200-T5.01	Project No.:	
Creator:	Date:	Name:	Description: Earthing systems				
Editor:	Status:		Comment: Connection of round and flat conductors with earthing rod.				
Ind.	Amendment typical	Date:	Name:			Scale:	Sheet size:
						Sheet:	of:

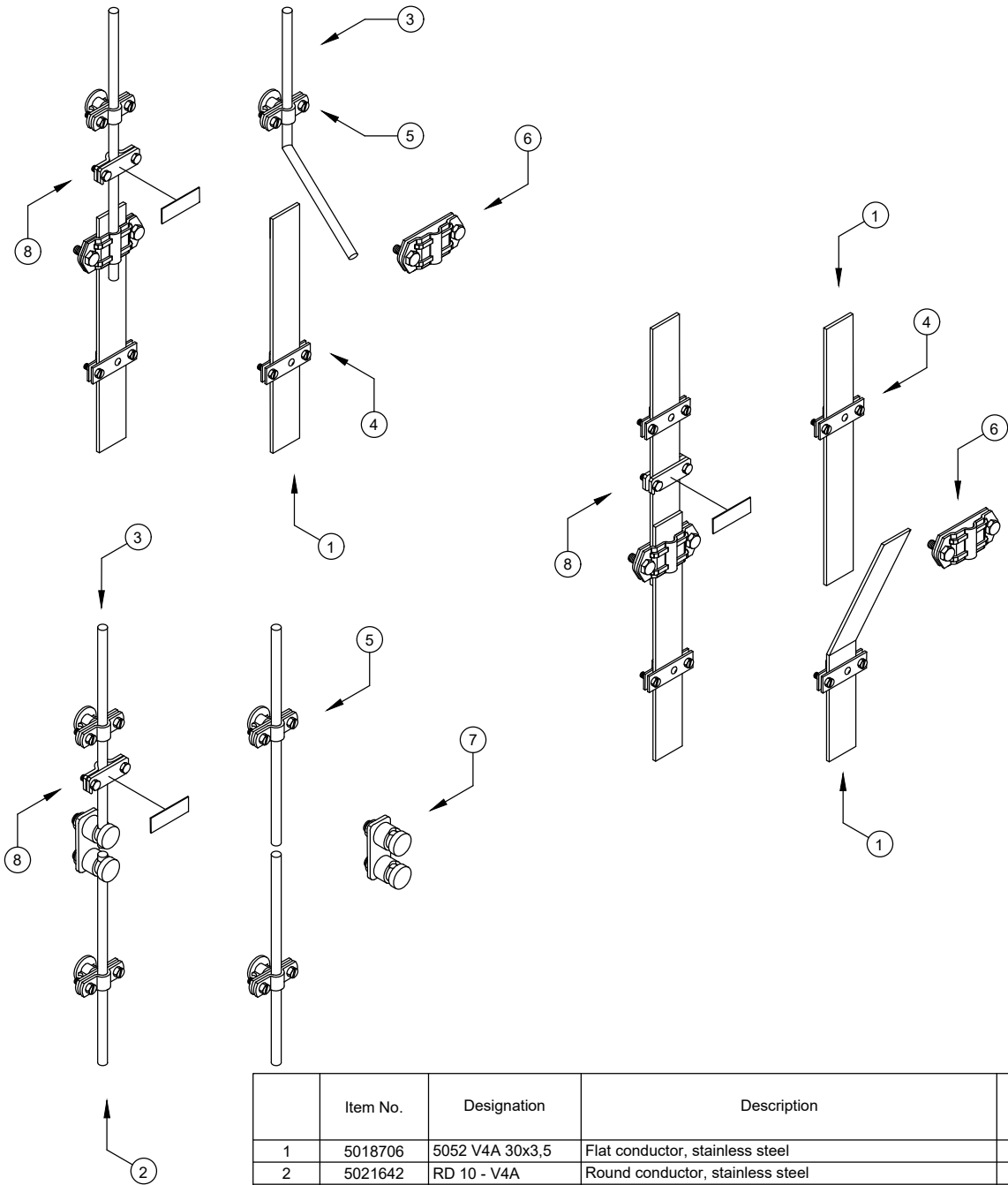
## 7 Earthing systems




	Item No.	Designation	Description	Q-ty
1	5000017	219 20 OMEX FT	OMEX earthing rod	
2	5000947	219 20 BP FT	BP earthing rod	
3	5000742	219 20 ST FT	Earthing rod for standard applications	
4	5000300	LE ERDER FT	LightEarth earthing rod	
5	3041204	1819 20	Driving spike for OMEX earth rod	
6	3041212	1819 20BP	Driving spike for ST and BP earth rod	
7	3041409	LE SPITZE	Driving spike for LightEarth earth rod	
8	3042200	1820 20	Impact head for earthing rods ST, BP and OMEX	
9	3044904	2536 20	Hammer insert, type 2536, for earthing rods ST, BP and OMEX	
10	3043312	2510 20	Hammer insert, type 2510, for earthing rods ST, BP and OMEX	
11	3043703	2520 20	Hammer insert, type 2520, for earthing rods ST, BP and OMEX	
12	3043401	2530 20	Hammer insert, type 2530, for earthing rods ST, BP and OMEX	
13	3043908	2531 20	Hammer insert, type 2531, for earthing rods ST, BP and OMEX	
14	3043916	2535 20	Hammer insert, type 2535, for earthing rods ST, BP and OMEX	
15	3043207	2500 20	Hammer insert, type 2500, for earthing rods ST, BP and OMEX	
16	3042308	LE KOPF	Impact head for LightEarth earthing rod	
17	3043602	LE HAMMER-SDS-M	Hammer insert for LightEarth earthing rod	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.02	Project No.:
Date:	Name:	Description: Earthing systems  Comment: Types of earthing rods and accessories for their mounting			
Creator:					
Editor:					
Status:					
Ind.	Amendment typical	Date:	Name:		Scale: Sheet: of:

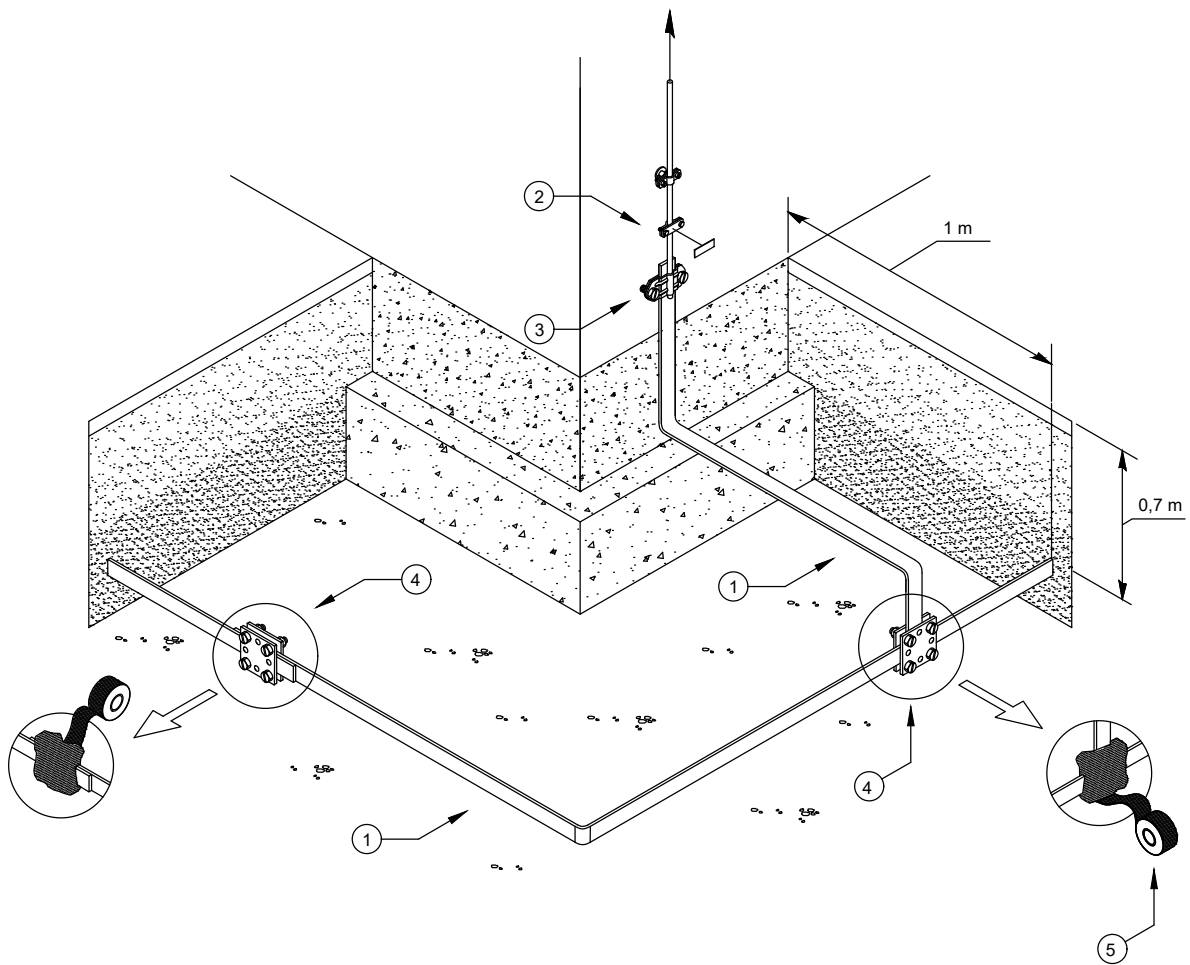
## 7 Earthing systems




	Item No.	Designation	Description	Q-ty
1	5018706	5052 V4A 30x3,5	Flat conductor, stainless steel	
2	5021642	RD 10 - V4A	Round conductor, stainless steel	
3	5021294	RD 8-ALU-T	Round conductor, aluminium	
4	5032539	832 30	Spacer clip for flat conductor, with fastening hole Ø 7 mm	
5	5229960	113 Z8-10	Cable bracket with crossbar Rd 8-10 mm	
6	5236457	233 A VA	Separating piece for Rd 8-10 and FL 30-40 mm	
7	5304270	5002 N-VA	Connector, Rd 8-10 mm, double, with pressure through	
8	3049256	311 N-ALU 8-10	Number plates	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.03	Project No.:
Date:	Name:	Description:			
Creator:		Earthing systems			
Editor:		Comment:			
Status:		Options for organizing the separation point of the down-conductors and the earth lead for different types of conductors.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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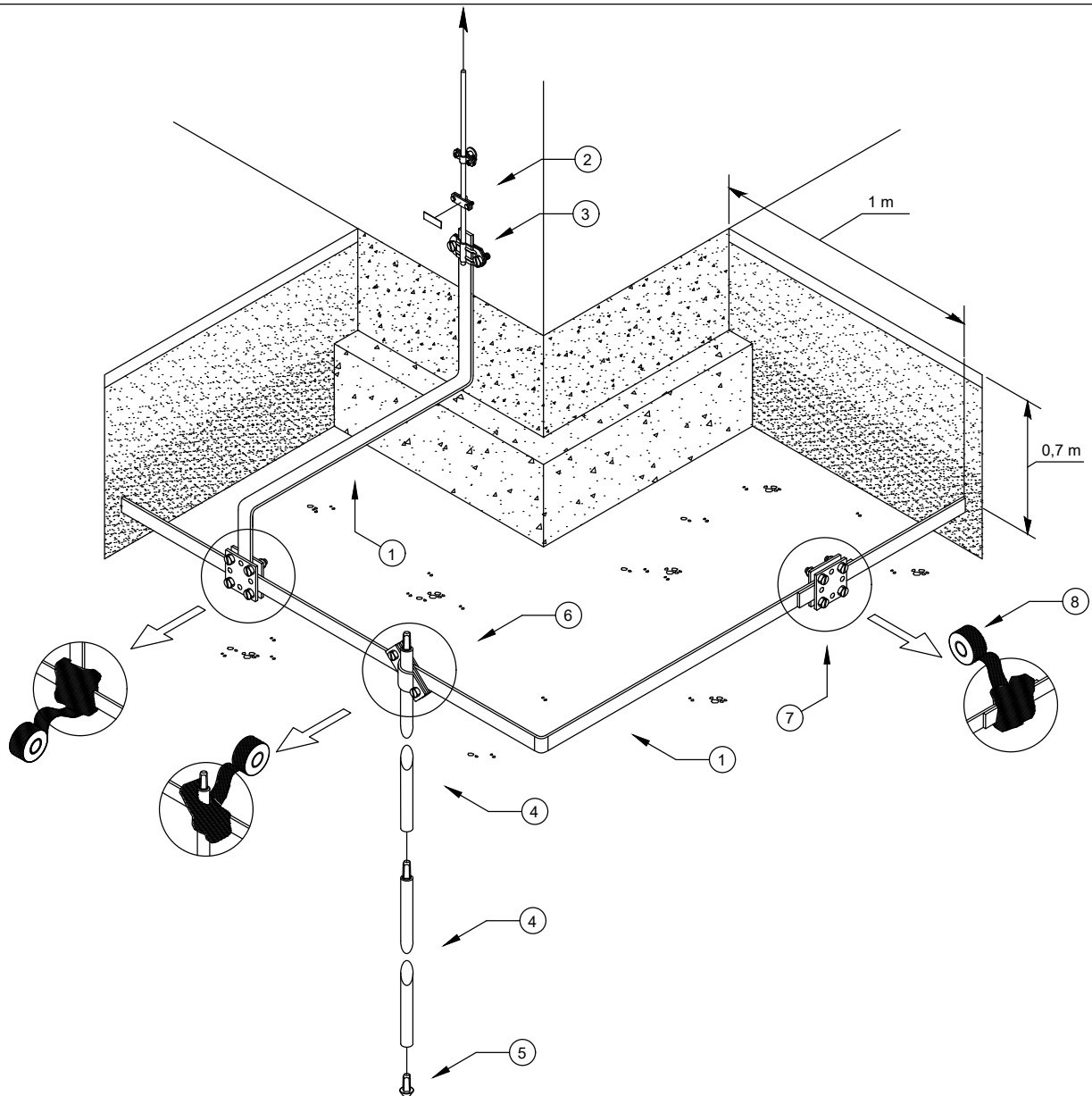
## 7 Earthing systems




	Item No.	Designation	Description	Q-ty
1	5018706	5052 V4A 30x3,5	Flat conductor, stainless steel	
2	3049256	311 N-ALU 8-10	Number plates	
3	5336341	233 VA	Separating piece for Rd 8-10 and FL 30 mm	
4	5314659	256 A-DIN 30V4A	DIN cross-connector for flat conductor	
5	2360055	356 50	Plastic corrosion protection strip	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.04	Project No.:
Date:	Name:	Description:			
Creator:		Earthing systems			
Editor:		Comment:			
Status:		Laying a flat conductor around the perimeter of the building as a earth lead.			
Ind.	Amendment typical	Date:	Name:		Scale:
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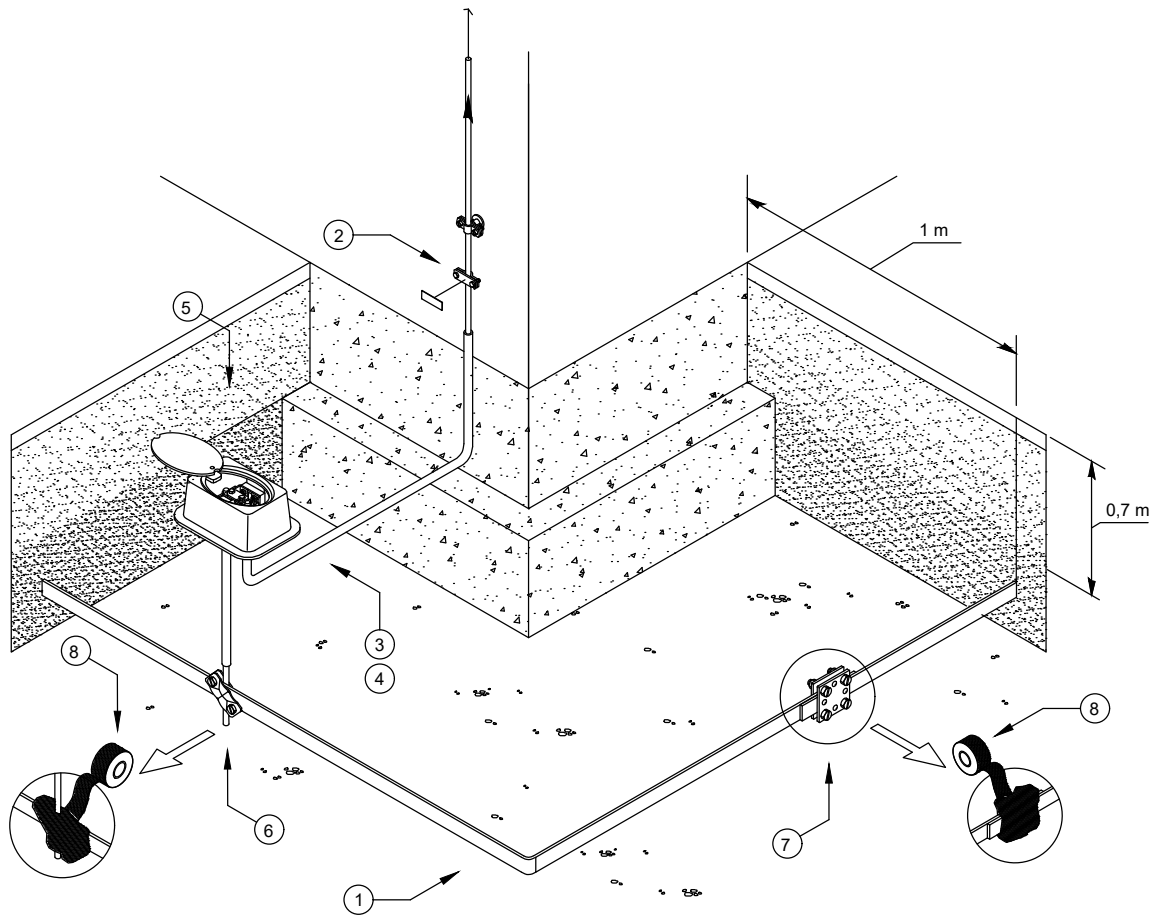
## 7 Earthing systems




	Item No.	Designation	Description	Q-ty
1	5018706	5052 V4A 30x3,5	Flat conductor, stainless steel	
2	3049256	311 N-ALU 8-10	Number plates	
3	5336341	233 VA	Separating piece for Rd 8-10 and FL 30 mm	
4	5000858	219 20 BP V4A	BP earthing rod	
5	3041212	1819 20BP	Driving spike for ST and BP earth rod	
6	5001633	2760 20 V4A	Connection clamp for earth rod, universal	
7	5314659	256 A-DIN 30 V4A	DIN cross- connector for flat conductor	
8	2360055	356 50	Plastic corrosion protection strip	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.05	Project No.:
Date:	Name:	Description:			
Creator:		Earthing systems			
Editor:		Comment:			
Status:		Laying a flat conductor around the perimeter of the building in combination with earthing rod.			
Ind.	Amendment typical	Date:	Name:		Scale:
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## 7 Earthing systems

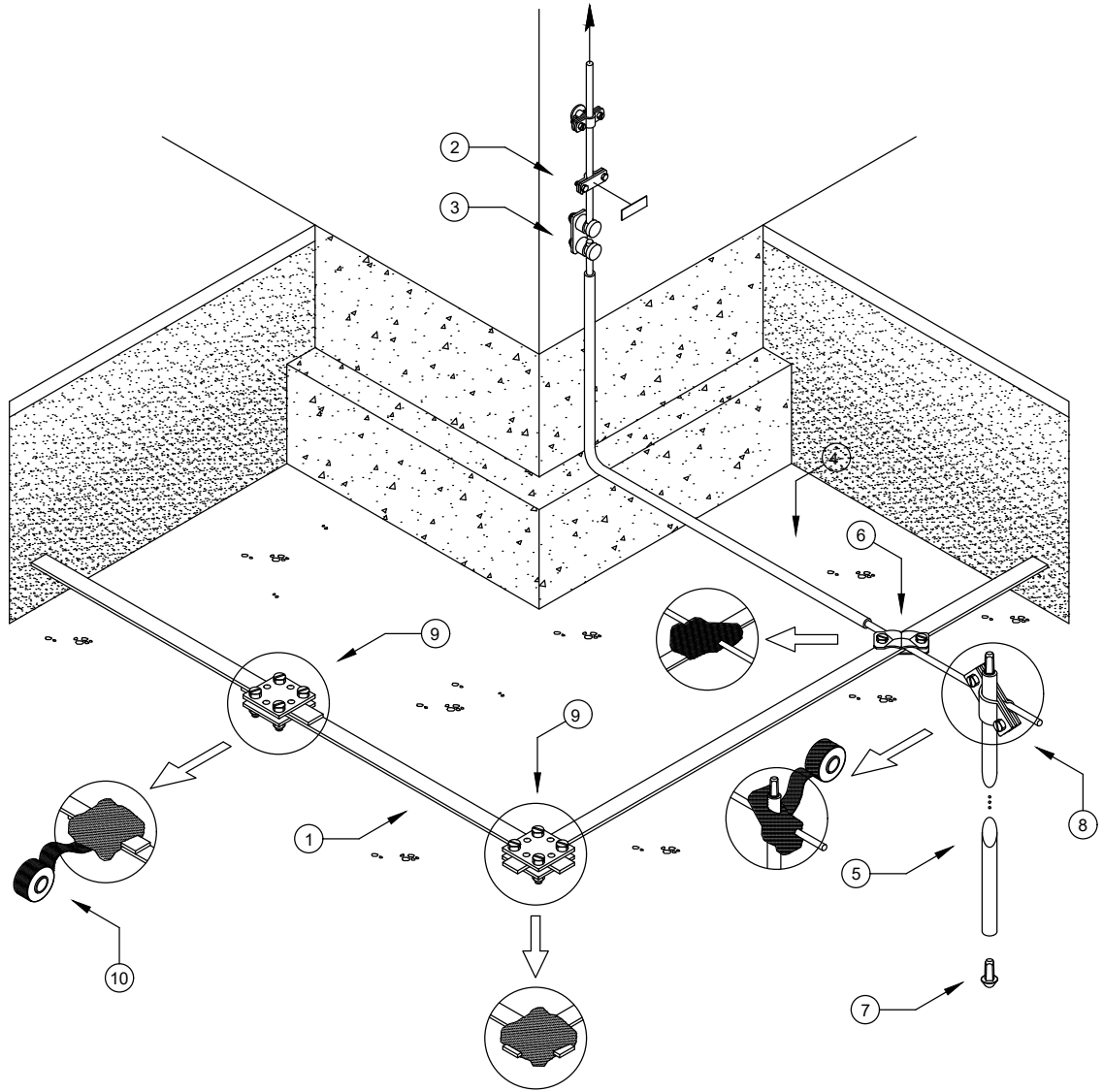


	Item No.	Designation	Description	Q-ty
1	5018706	5052 V4A 30x3,5	Flat conductor, stainless steel	
2	3049256	311 N-ALU 8-10	Number plates	
3	5021081	RD 8 FT	Round conductor, galvanised steel	
4			Shrink tubing (corrosion protection)	
5	5106003	5700 SP	Inspection pit with integrated separation piece	
6	5313023	250 A-VA	Diagonal clamp for flat conductors and round conductors	
7	5314659	256 A-DIN 30 V4A	DIN cross-connetor for flat conductor	
8	2360055	356 50	Plastic corrosion protection strip	


Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.06	Project No.:
Date:	Name:	Description:			
Creator:		Earthing systems			
Editor:		Comment:			
Status:		Installation of a inspection pit between the earthing systems and down-conductors.			
Ind.	Amendment typical	Date:	Name:		Scale:
				BETTERMANN	Sheet size:
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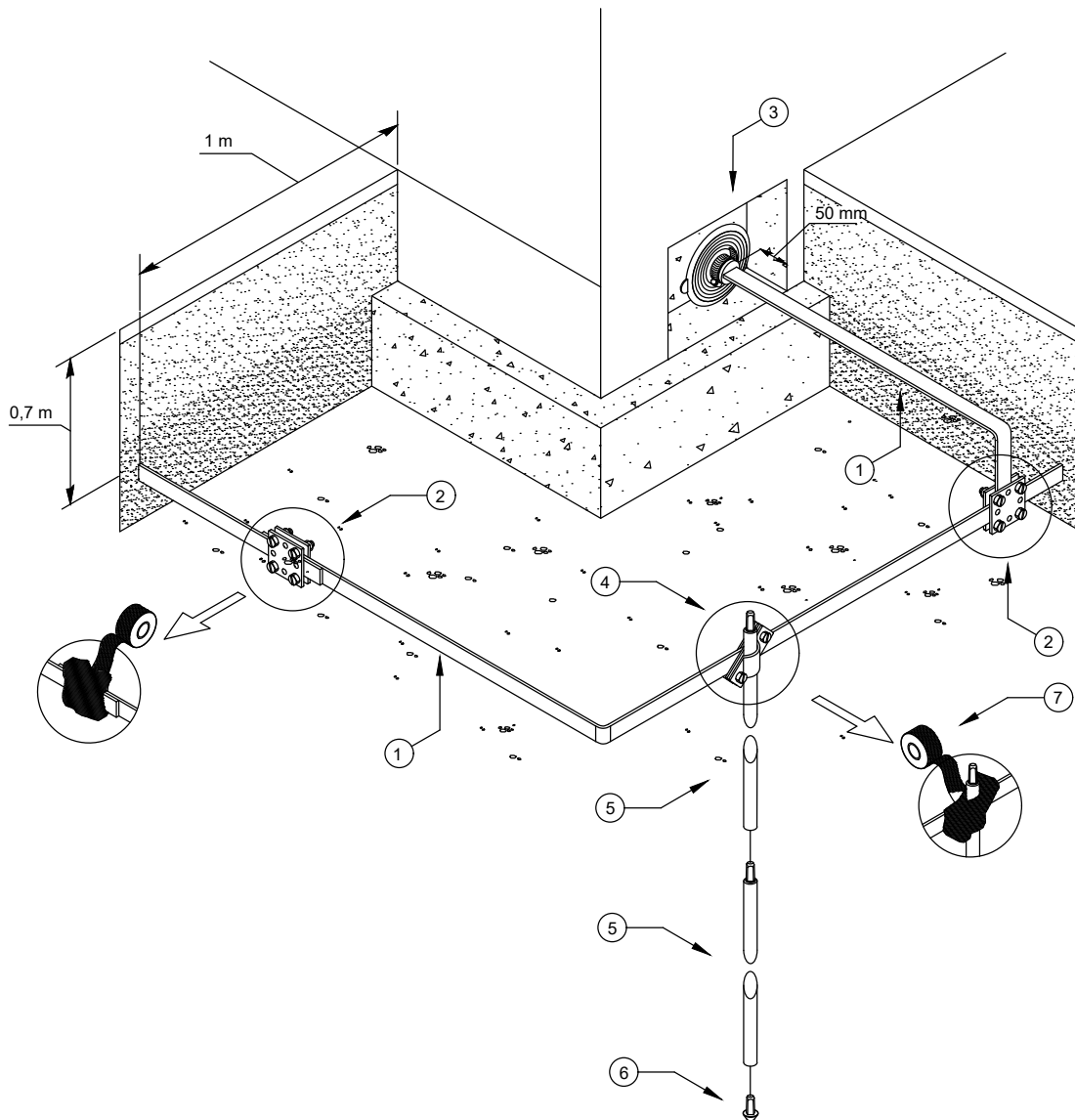
## 7 Earthing systems



	Item No.	Designation	Description	Q-ty
1	5018706	5052 V4A 30x3,5	Flat conductor, stainless steel	
2	3049256	311 N-ALU 8-10	Number plates	
3	5304270	5002 N-VA	Connector, Rd 8-10 mm, double, with pressure trough	
4	5021162	RD 10 PVC	Round conductor, galvanised steel with PVC jacketing	
5	5000858	219 20 BP V4A	BP earthing rod	
6	5313023	250 A-VA	Diagonal clamp for flat conductors and round conductors	
7	3041212	1819 20 BP	Driving spike for ST and BP earth rod	
8	5001633	2760 20 V4A	Connection clamp for earth rod, universal	
9	5314659	256 A-DIN 30 V4A	DIN cross-connector for flat conductor	
10	2360055	356 50	Plastic corrosion protection strip	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.07	Project No.:
Date:	Name:	Description:			
Creator:		Earthing systems			
Editor:		Comment:			
Status:		Laying a flat conductor around the perimeter of the building in combination with earthing rod.			
Ind.	Amendment typical	Date:	Name:		Scale: Sheet size:
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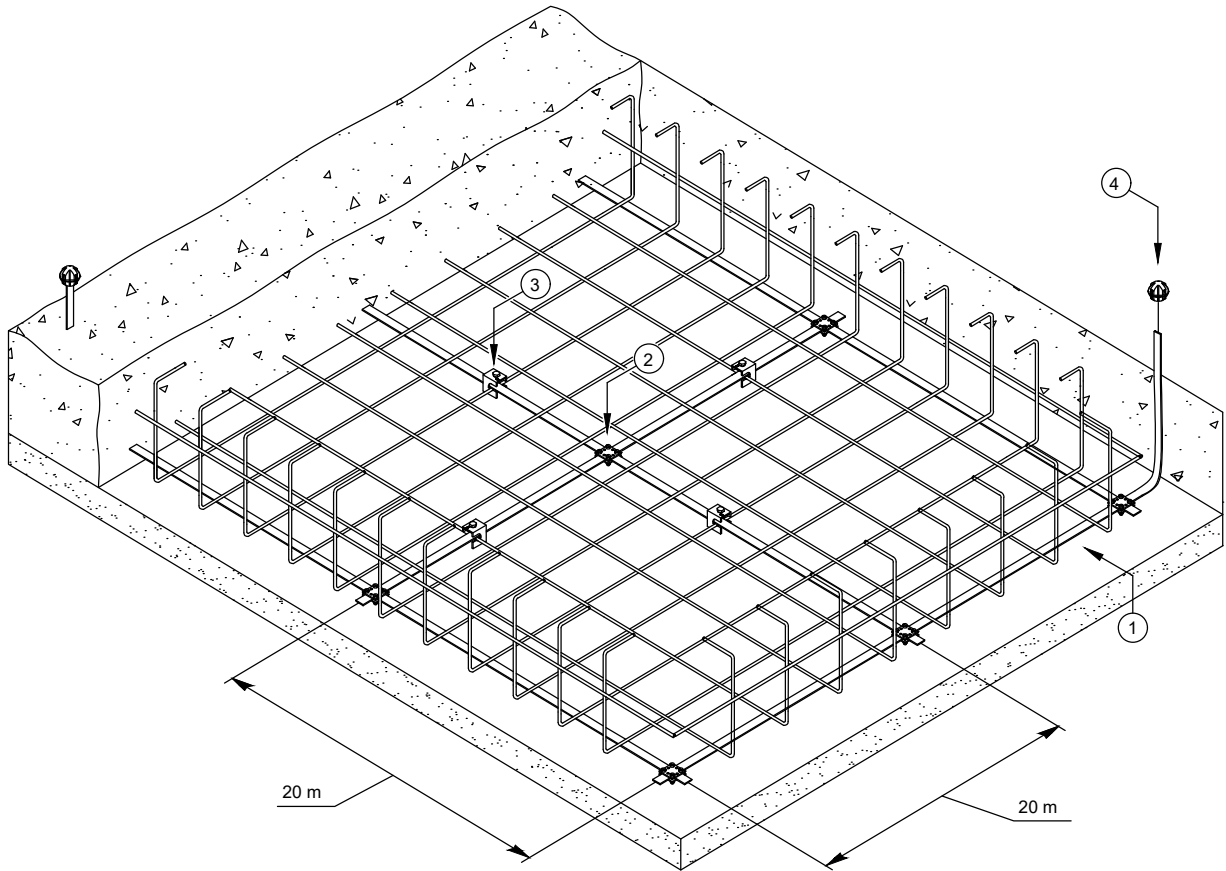
## 7 Earthing systems



	Item No.	Designation	Description	Q-ty
1	5018706	5052 V4A 30x3,5	Flat conductor, stainless steel	
2	5314659	256 A-DIN 30 V4A	DIN cross-connector for flat conductor	
3	2360043	DW FL 30x3,5	Sealing sleeve for flat conductors	
4	5001633	2760 20 V4A	Connection clamp for earth rod, universal	
5	5000858	219 20 BP V4A	BP earthing rod	
6	3041212	1819 20 BP	Driving spike for ST and BP earth rod	
7	2360055	356 50	Plastic corrosion protection strip	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.08	Project No.:
Date:	Name:	Description: Earthing systems			
Creator:		Comment: Connecting the main earthing busbar (MEB) outside to the buildings earthing system.			
Editor:					
Status:					
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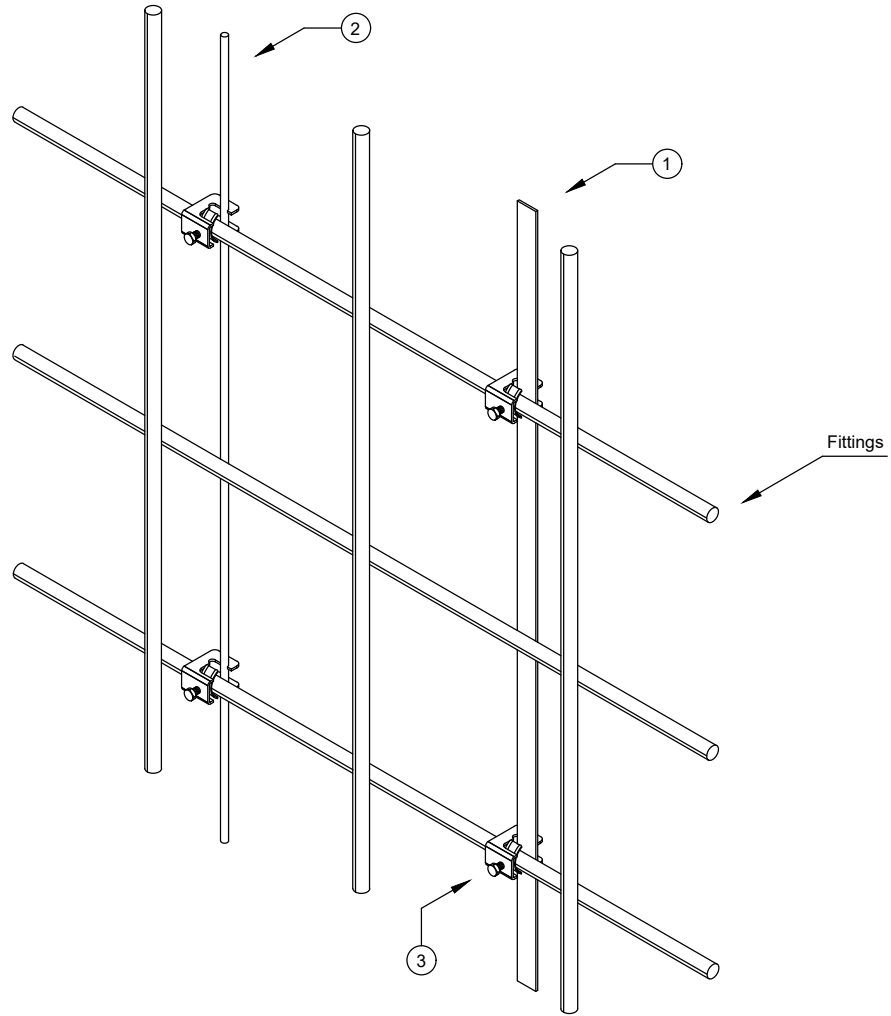
## 7 Earthing systems





	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5314658	256 A-DIN 30 FT	DIN cross-connector for flat conductor	
3	5014468	1814 FT	Connection terminal for reinforced steels	
4	5018014	ProtectionBall	Protective cap for connection lugs, reflective	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.09	Project No.:
Date:	Name:	Description: Earthing systems			
Creator:		Comment: Foundation earthing system. Fixing of flat conductors to fittings.			
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		

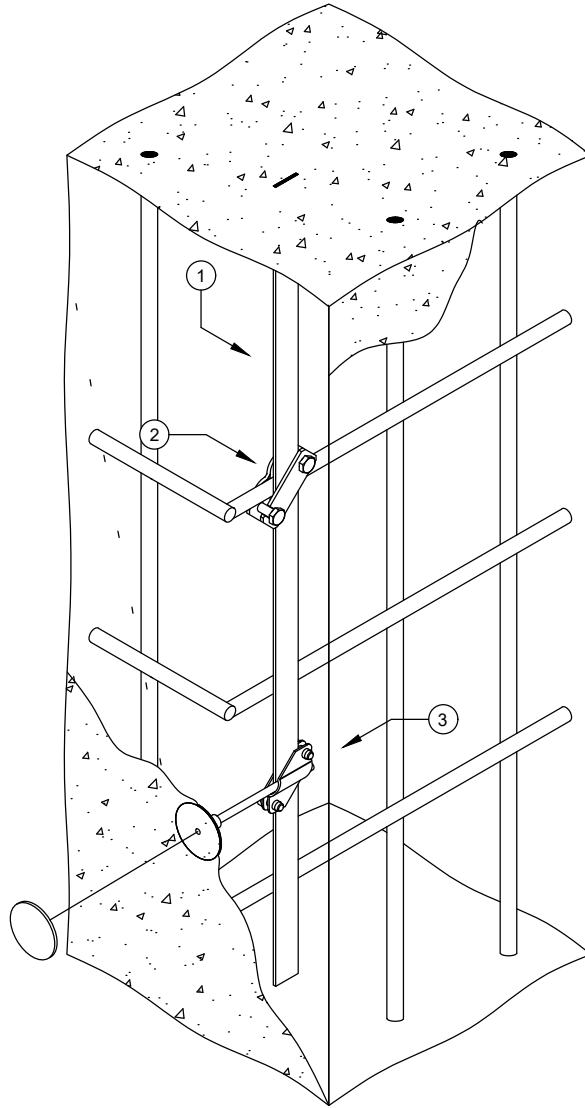
## 7 Earthing systems



	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5021103	RD 10	Round conductor, galvanised steel	
3	5014469	1814 FT D37	Connection terminal for large reinforced steels	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.10	Project No.:
Date:	Name:	Description: Earthing systems			
Creator:		Comment: Foundation earthing system. Fixing of flat conductors and round conductors to fittings.			
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		Sheet: of:

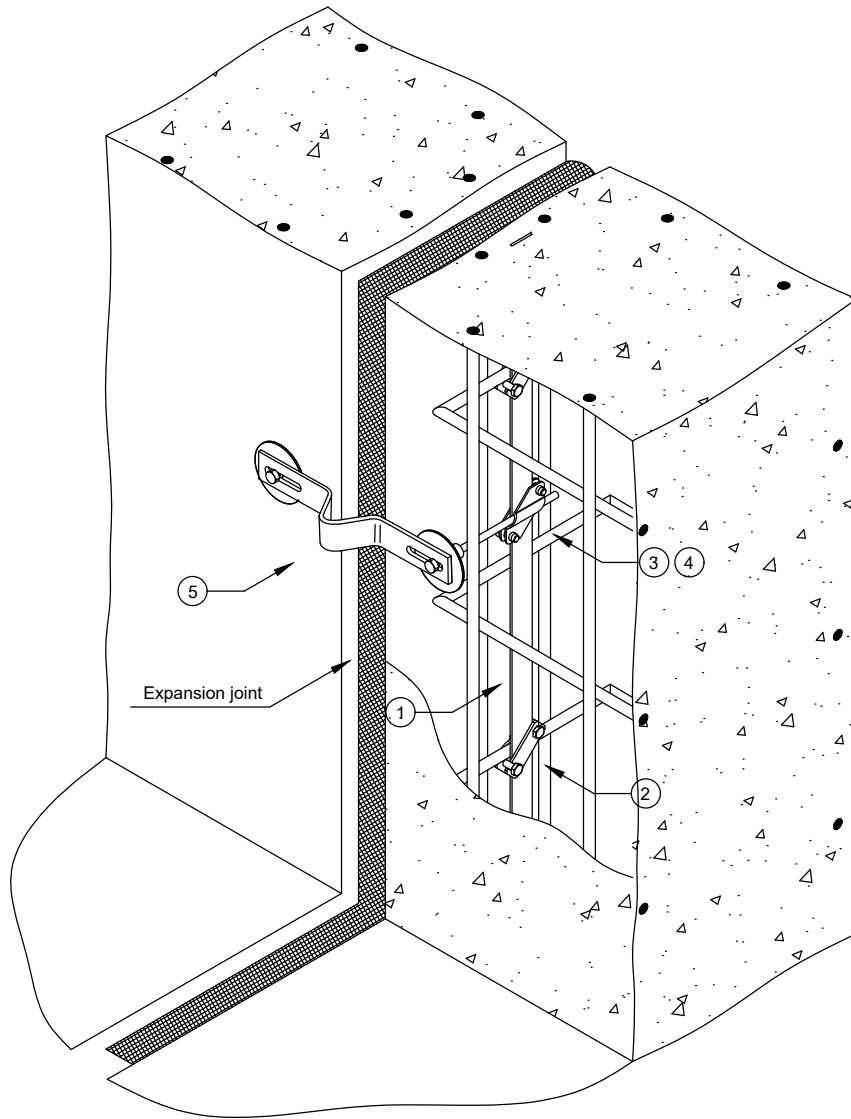
## 7 Earthing systems



	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5313031	250 AS-FT	Diagonal clamp for flat conductors and round conductors	
3	5312925	250 V4A	Cross-connector for flat conductors and round conductors	
4	5420022	205 DG L180 V4A	Fixed earthing point	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.11	Project No.:
Date:	Name:	Description: Earthing systems			
Creator:		Comment: Foundation earthing system. Output of the connection point to the surface.			
Editor:					
Status:					
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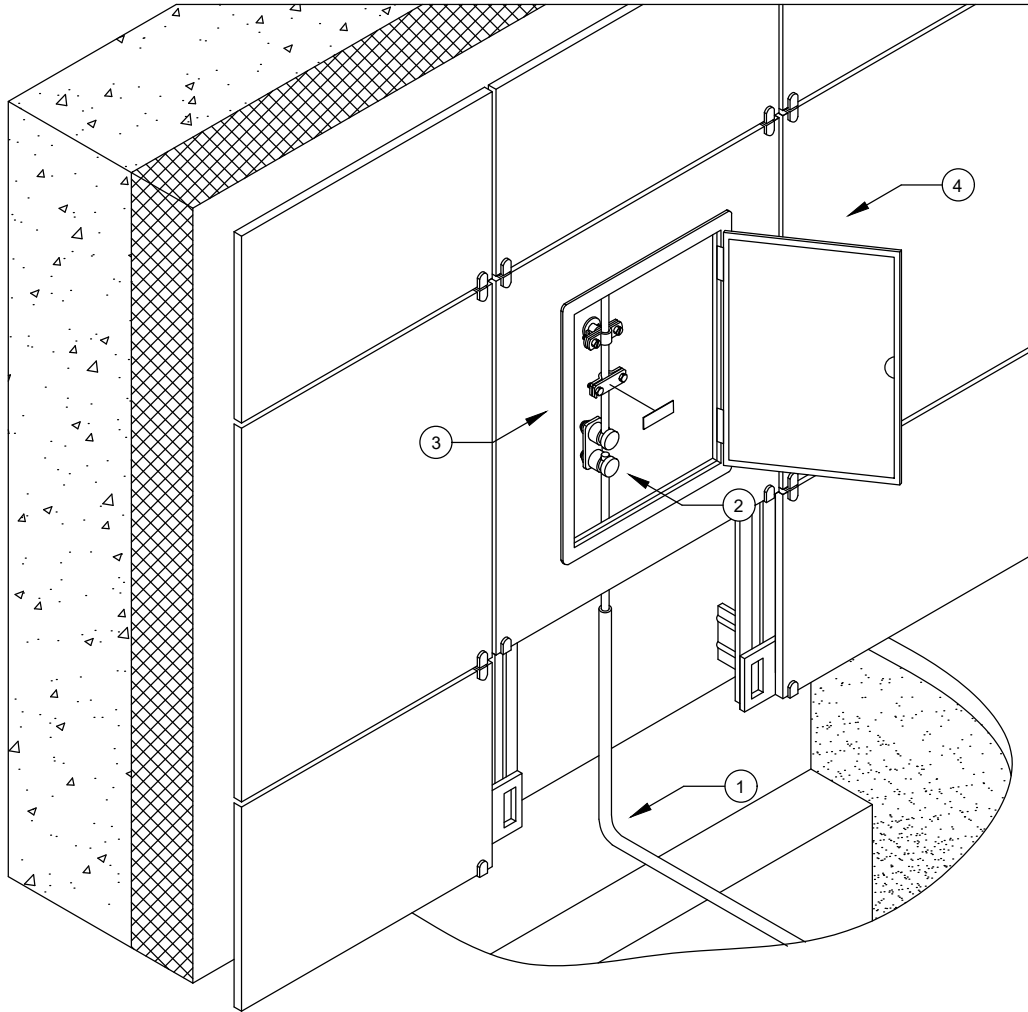
## 7 Earthing systems




	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5313031	250 AS-FT	Diagonal clamp for flat conductors and round conductors	
3	5312925	250 V4A	Cross-connector for flat conductors and round conductors	
4	5420022	205 DG L180 V4A	Fixed earthing point	
5	5016142	1807	Expansion piece	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.12	Project No.:
Date:	Name:	Description: Earthing systems			
Creator:		Comment: Foundation earthing system. Installation of a compensator at a deformation joint.			
Editor:					
Status:					
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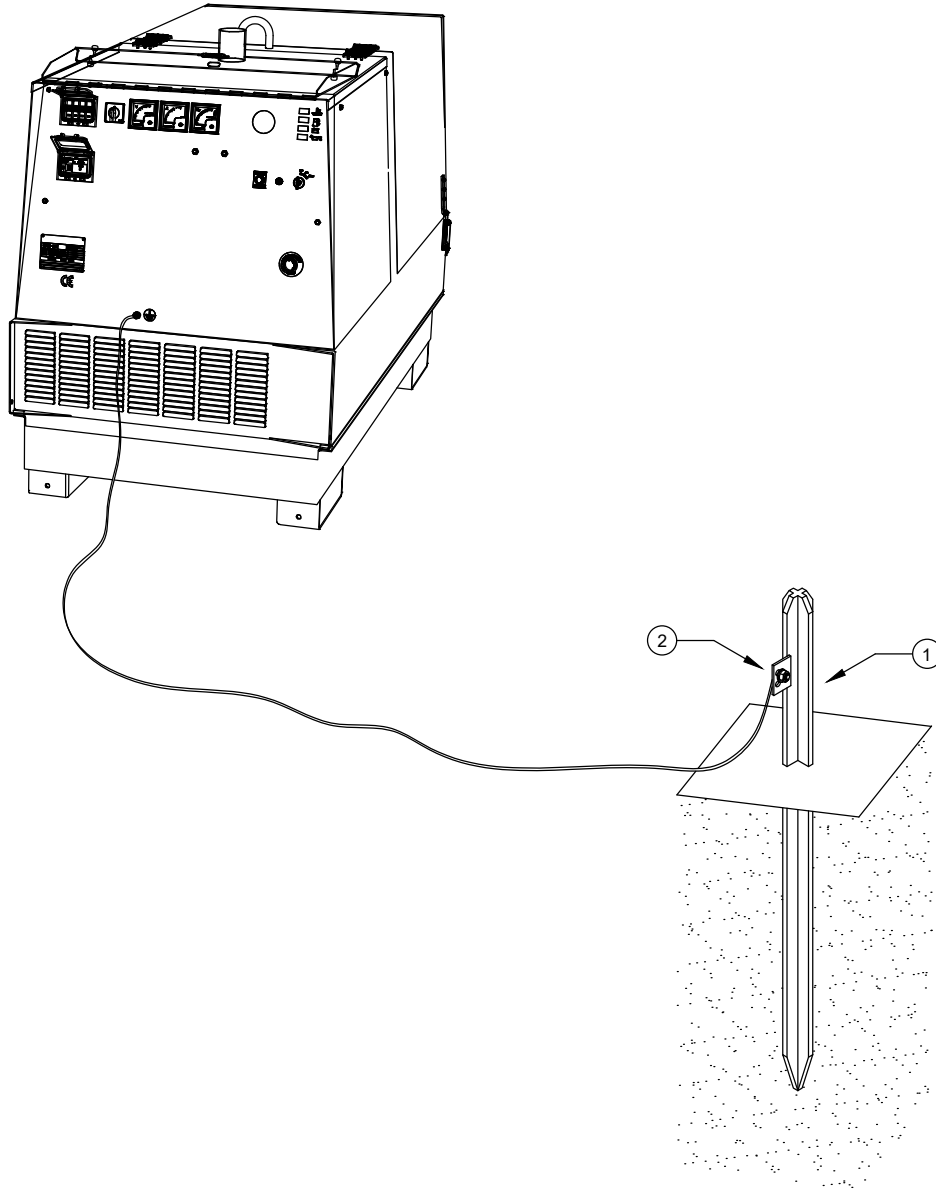
## 7 Earthing systems




	Item No.	Designation	Description	Q-ty
1	5021162	RD 10 PVC	Round conductor, galvanised steel with PVC jacketing	
2	5304270	5002 N-VA	Connector, Rd 8-10 mm double, with pressure trough	
3	3049256	311 N-ALU 8-10	Number plates	
4	5106141	5800 VA	Inspection door	

Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.13	Project No.:
Date:	Name:	Description: Earthing systems			
Creator:		Comment: Installation of the inspection door on the cladding of the ventilated facade.			
Editor:					
Status:					
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## 7 Earthing systems

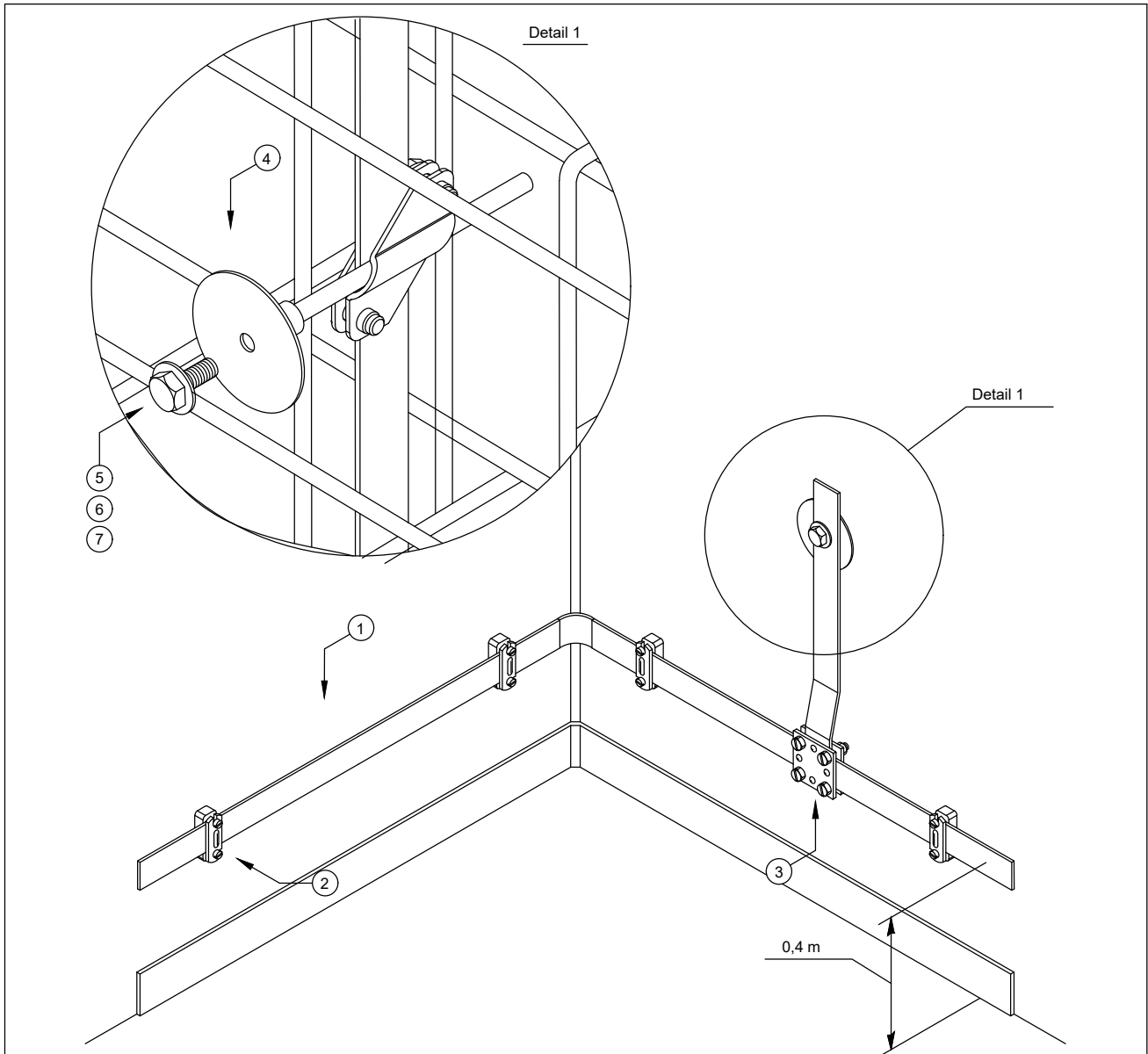


	Item No.	Designation	Description	Q-ty
1	5003040	213 3000 DIN	Profile earthing rod with connecting lug	
2	5040507	928	Earthing terminal for fastening on earthing strap	



Drawing-No.:		PE 02	PF 200	Typical-No.: OBO-TBS-200-T5.14	Project No.:
Date:	Name:	Description: Earthing systems			
Creator:		Comment: Portable grounding of equipment.			
Editor:					
Status:					
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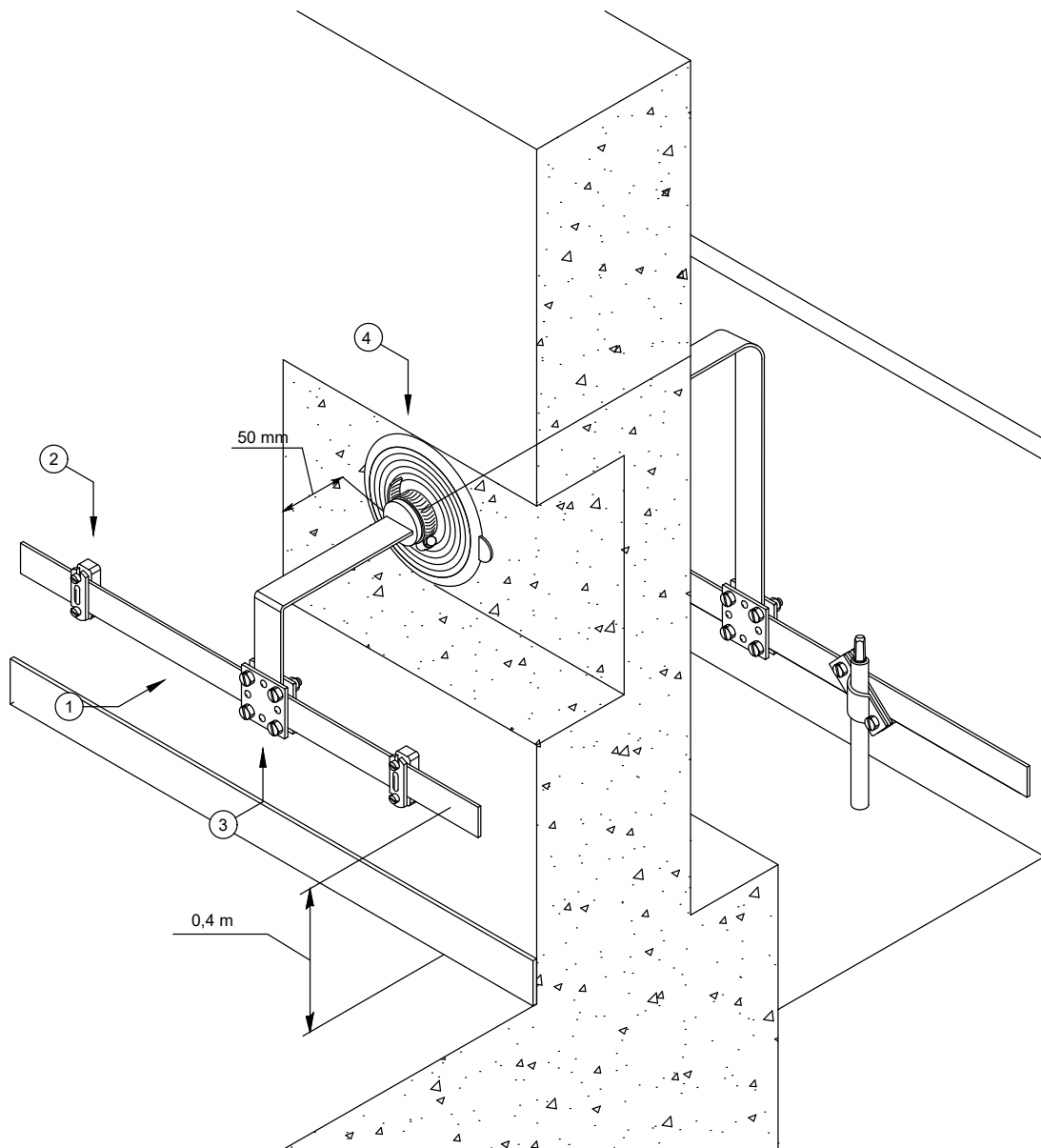
## 8 Equipotential bonding systems





	Item No.	Designation	Description	Q-ty	
	1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
	2	5033039	833 35	Spacer clip for flat conductor, with polyamide base	
	3	5314658	256 A-DIN 30 FT	DIN cross-connector for flat conductor	
	4	5420024	205 DG L180 FT	Fixed earthing point	
	5	3060203	HHS M10x20 G	Hexagonal bolt ISO 4017	
	6	3402460	966 M10 F	Washer F	
	7	3404102	SWS M10 G	Serrated washer DIN 6798 G	

Drawing-No.:		PE 02	PF 150	Typical-No.: OBO-TBS-150-T6.01	Project No.:
Date:	Name:	Description:			
Creator:		Equipotential bonding system			
Editor:		Comment:			
Status:		Mounting the equipotential bonding bus. Connection to the foundation earthing system on the wall.			
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Ind.	Amendment typical	Date:	Name:	Sheet:	of:

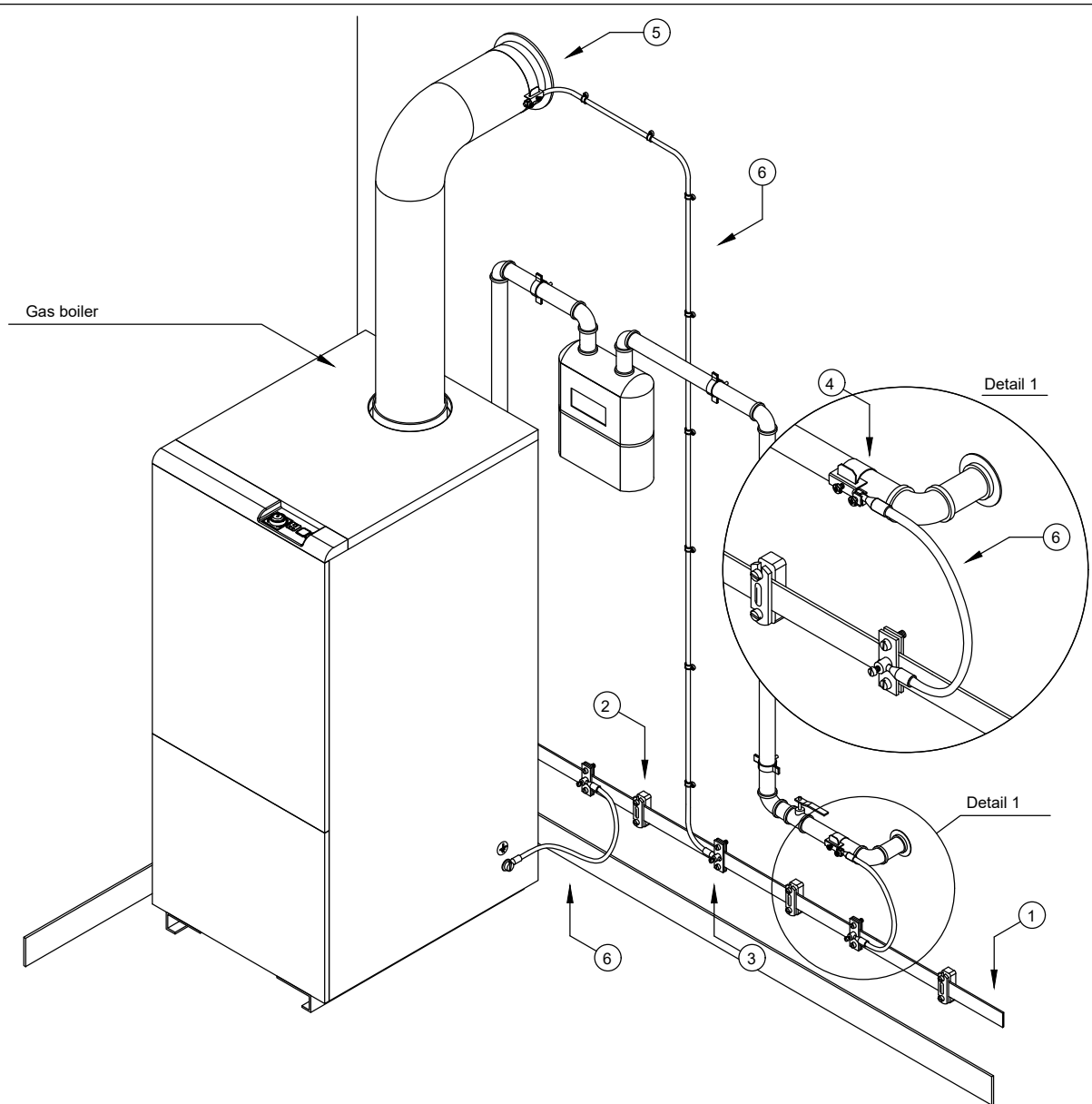
## 8 Equipotential bonding systems



	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5033039	833 35	Spacer clip for flat conductor, with polyamide base	
3	5314658	256 A-DIN 30 FT	DIN cross-connector for flat conductor	
4	2360043	DW FL30x3,5	Sealing sleeve for flat conductors	

Drawing-No.:		PE 02	PF 150	Typical-No.: OBO-TBS-150-T6.02	Project No.:
Date:	Name:	Description: Equipotential bonding system  Comment: Mounting the equipotential bonding bus. Output to external earthing system.			
Creator:					
Editor:					
Status:					
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Ind.	Amendment typical	Date:	Name:		

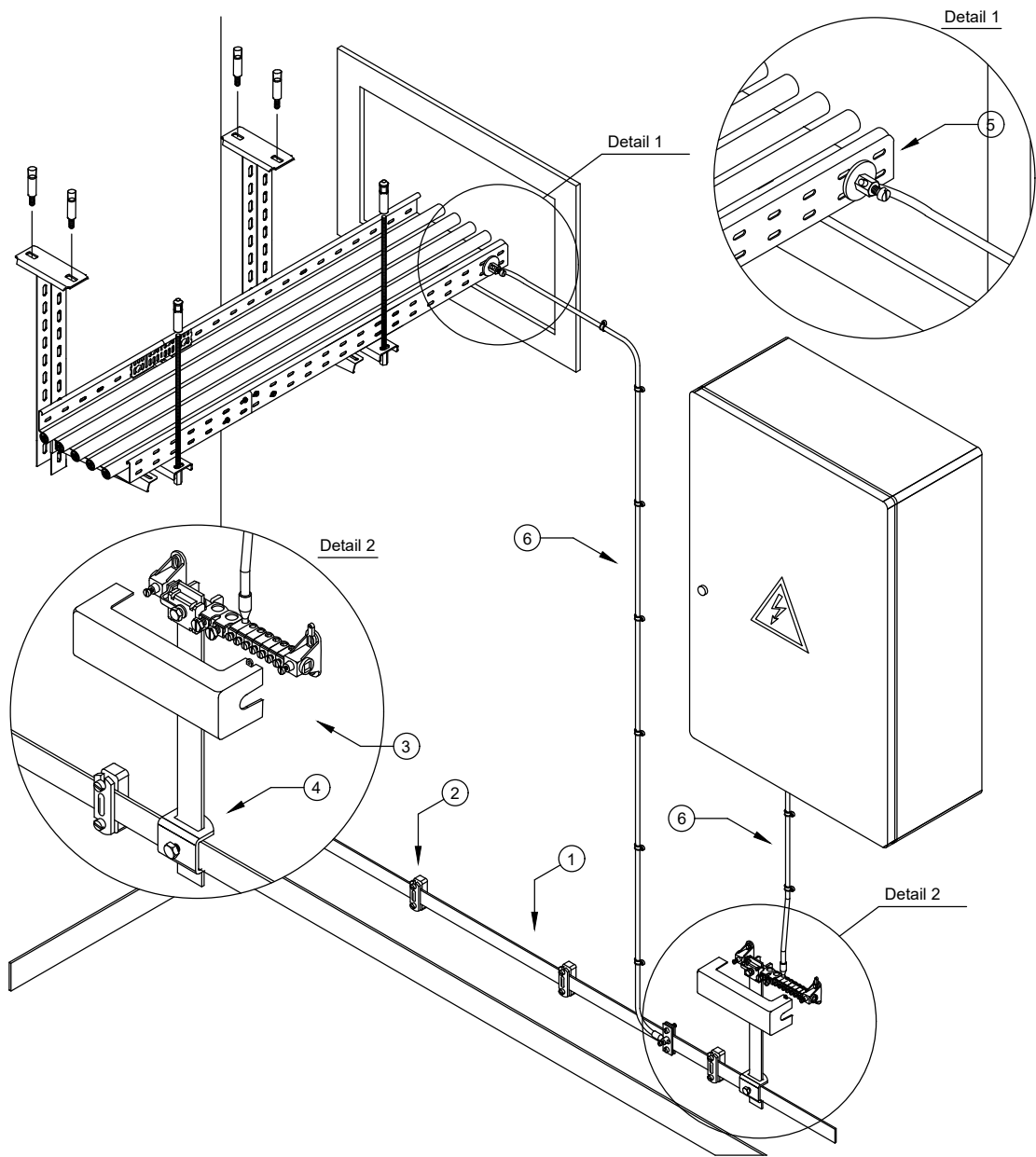
## 8 Equipotential bonding systems



	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5033039	833 35	Spacer clip for flat conductor, with polyamide base	
3	5043107	939	Earthing terminal for cables and flat conductors	
4	5057523	927 2	Earthing pipe clamp VA	
5	5057558	927 4	Earthing pipe clamp VA	
6			Earthing cable min. 6 mm <sup>2</sup>	

Drawing-No.:		PE 02	PF 150	Typical-No.: OBO-TBS-150-T6.03	Project No.:
Date:	Name:	Description: Equipotential bonding system			
Creator:		Comment: Connection of the gas boiler to the equipotential bonding bus.			
Editor:					
Status:					
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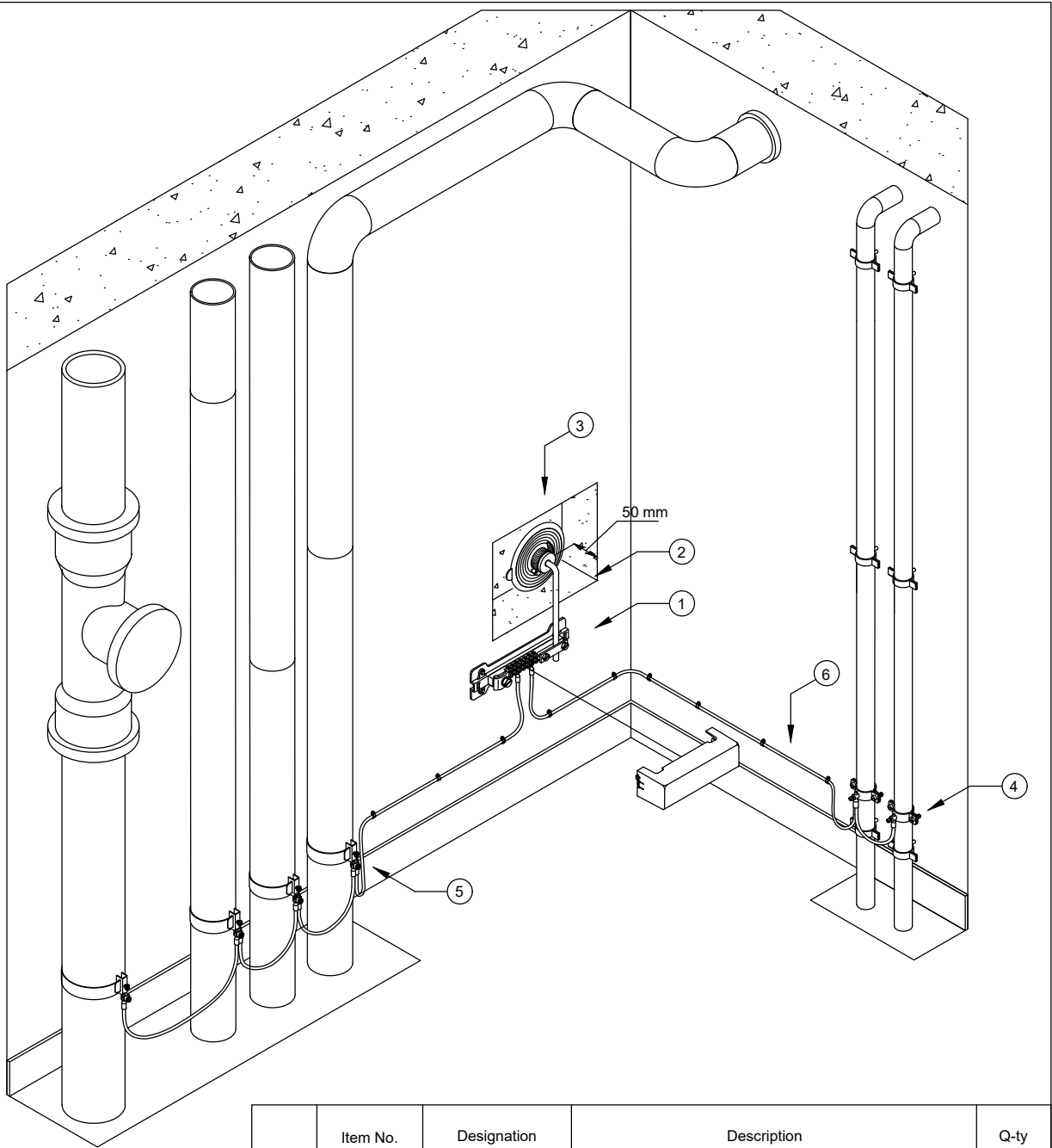
## 8 Equipotential bonding systems



	Item No.	Designation	Description	Q-ty
1	5019347	5052 DIN 30x3,5	Flat conductor, galvanised steel	
2	5033039	833 35	Spacer clip for flat conductor, with polyamide base	
3	5015650	1801 VDE	Equipotential bonding rail for indoors, VDE tested	
4	5014425	1813 KL	Variable earthing terminal	
5	5040507	928	Earthing terminal for fastening on earthing strap	
6			Earthing cable min. 6 mm <sup>2</sup>	

Drawing-No.:		PE 02	PF 150	Typical-No.: OBO-TBS-150-T6.04	Project No.:
Date:	Name:	Description: Equipotential bonding system			
Creator:		Comment: Connection the sub-distributor and cable tray systems to the equipotential bonding rail.			
Editor:					
Status:					
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## 8 Equipotential bonding systems



	Item No.	Designation	Description	Q-ty	
	1	5015081	1809 M	Equipotential bonding rail with metal base plate	
	2	5021103	RD 10	Round conductor, galvanised steel	
	3	2360041	DW RD10	Sealing sleeve for round conductors	
	4	5040159	925 1 1/2	Earthing clamp, type 925	
	5	5057558	927 4	Earthing pipe clamp VA	
	6			Earthing cable min. 6 mm <sup>2</sup>	

Drawing-No.:		PE 02	PF 150	Typical-No.: OBO-TBS-150-T6.05	Project No.:
Date:	Name:	Description: Equipotential bonding system			
Creator:		Comment: Connection of water and heating pipes to a equipotential bonding rail.			
Editor:					
Status:					
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**OBO Bettermann Austria GmbH**

OBO-Bettermann-Straße 1

2440 Gramatneusiedl

ÖSTERREICH

**Kundenservice Österreich**

Tel.: +43 720 105 400

E-Mail: [info.wien@obo.at](mailto:info.wien@obo.at)

[www.obo.at](http://www.obo.at)

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**Building Connections**

