PRODUCT CATALOGUE

Furse® Earthing & lightning protection

Quality solutions for safeguarding people, structures and services

Furse® Earthing & Lightning Protection provides a complete solution for safeguarding against lightning risk. From our own designed and manufactured products, through to risk assessment and systems design advice, Furse offers a renowned total solution for earthing and lightning protection.

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Furse® Earthing & Lightning Protection
Our reach & expertise

Furse® Earthing & Lightning Protection is part of ABB's Installation Products division.

With a heritage of over 130 years, the Furse® brand is synonymous with earthing and lightning protection, and is recognised worldwide for its Total Solution.

The Furse Total Solution incorporates all customer needs for earthing & lightning protection, including:

- Structural lightning protection systems
- Earthing for lightning protection, power and telecommunications systems
- Transient overvoltage protection
- Customer project consultations, technical guidance and system design

The Total Solution delivers the most complete and effective protection against lightning and earth fault current risk, both safeguarding life and ensuring continuous, normal operation of electrical and electronic systems.

Acquired by the ABB Group in 2012, and benefitting from ABB's wider network, Furse® Earthing & Lightning Protection has now become an established quality provider of earthing and lightning protection, with products specified and installed in many prestigious projects globally.

Why choose Furse products and services?
Being an integral part of ABB reinforces our commitment to quality, service and to providing solutions which deliver safety and protection of people, structures and electrical services within the built environment.

Furse products and services aim to deliver customer value in key areas:

- **Reliability & ease of installation**
  Furse products are manufactured from high quality materials within an ISO 9001 environment, to ensure long lasting performance, and are designed for easiest possible installation.
- **Convenience & support**
  Furse products are readily available through our network of distributors, and our sales are supported both locally and globally by technical guidance and support.
- **Expertise & experience**
  Our time served technical engineers provide specific advice on customers' earthing and lightning protection concerns, and can provide drawings and system designs to any recognised standard.

The value of earthing & lightning protection

Lightning is one of nature's most powerful and destructive phenomena. Lightning strikes present a real and significant threat to life, to the structures in which we live and work, and to the electronic systems which support us in our daily lives.

Lightning contains awesome amounts of electrical energy. Lightning discharges have been measured from several thousand to over 200,000 Amps (enough to light half a million 100 Watt bulbs) and even though of a very short duration, can cause tremendous damage and destruction.

Lightning can have devastating consequences:

- **Direct lightning strikes** damage structures, and create fire, explosion and electric shock hazards.
- **Indirect lightning** (up to a kilometre away) creates transient overvoltages which degrade electronic systems and disrupt essential services.

The effects of a direct strike are obvious and immediately apparent - buildings damaged, trees blown apart, personal injuries and even loss of life.

However, the secondary effects of lightning – the short duration, high voltage spikes called transient overvoltages - can, and do, cause equally catastrophic, if less visually obvious, damage to electronic systems within structures.

The need for a Total Solution

National and International lightning protection standards now stress the need for a comprehensive solution encompassing both structural lightning and electronic systems protection using Surge Protection Devices (SPDs).

Simply put, a structural lightning protection system cannot and will not protect electronic systems from lightning currents and transient overvoltages.

Earthing standards demand critical safety of the electrical installation and the personnel at site. Both quality of design and product material are paramount.

This is why we advocate our Total Solution to earthing and lightning protection - an approach which delivers effective life safety, together with long lasting, reliable protection of a structure and the electronic systems within.

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02 Trackside substations.
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03 Wind farms.
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05 Water treatment.
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Introduction

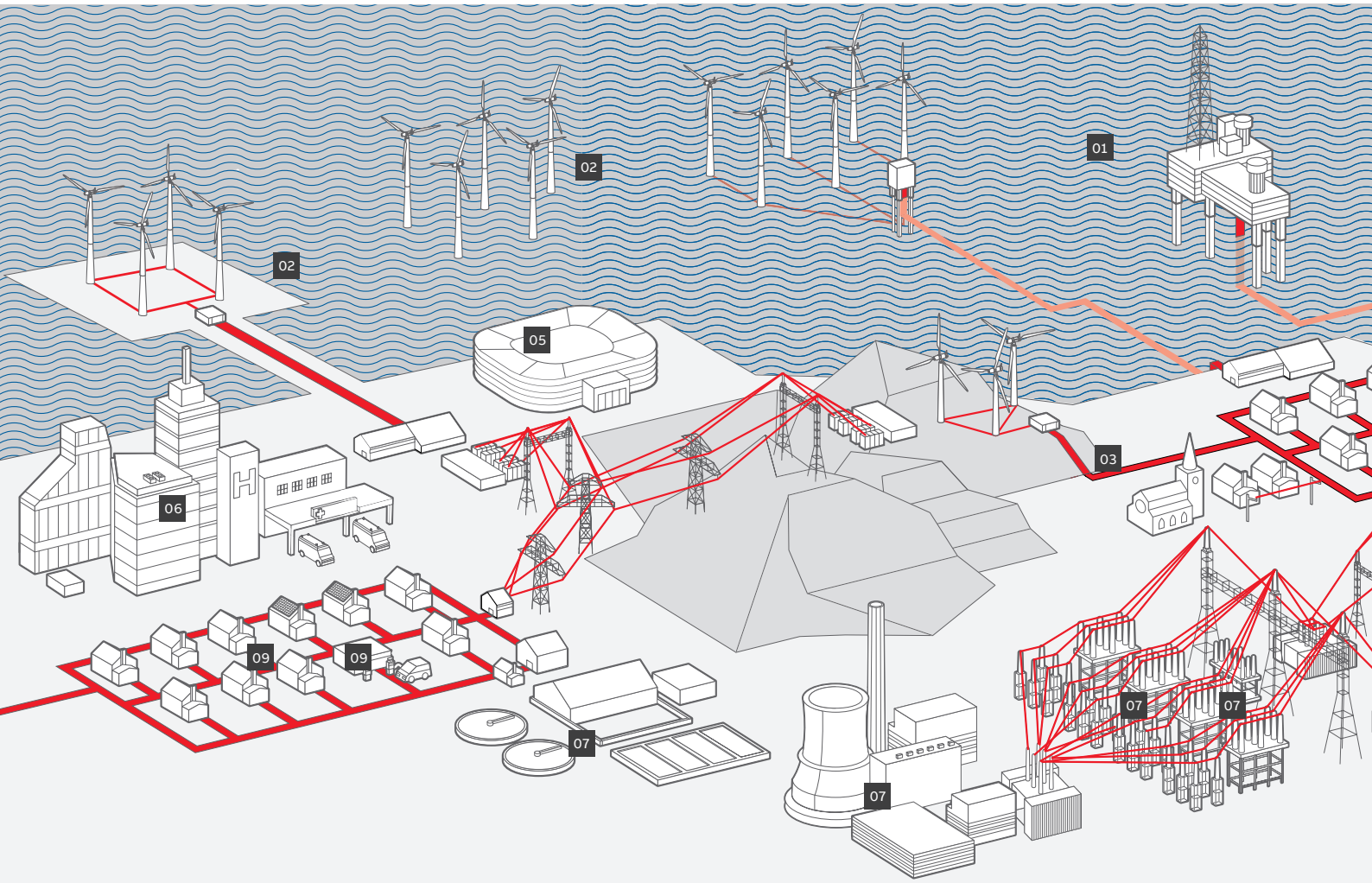
Earthing & Lightning Protection with over 130 years of expertise

For all our customers, the Furse Total Solution approach to earthing & lightning protection is the leading solution for all project types worldwide.

Oil & Gas/petrochemical
- Offshore platforms & oil fields
- Gas & oil refineries
- Pipelines
- Petrochemical processing

Renewable energies
- Solar/PV farms
- Wind turbines
- Hydro-power stations
- EV Charging

High tech & industrial
- Pharmaceutical factories
- High tech manufacturing & semi-conductor plants
- Telecoms stations, exchanges & transmission towers
- IT Parks and Technoparks
- Heavy industry including steel, cement, glass fibre & synthetics
- Data centres



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01 Oil & gas / petrochemical.
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02 Renewable energies.
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03 Cultural & heritage.
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04 High tech & industrial.
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05 Sports & recreation.
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06 Government & public sector.
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07 Utilities.
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08 Rail & infrastructure.
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09 Residential.
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10 Commercial construction.

Utilities
- Power stations (coal, gas, nuclear)
- Electricity substations
- Overhead transmission lines
- Waste water treatment facilities
- Desalination plants

Commercial construction
- Landmark commercial projects
- Financial services institutions
- Convention & exhibition centres
- Office blocks
- Stock exchanges & trade centres
- Commercial centres, showrooms & retail units

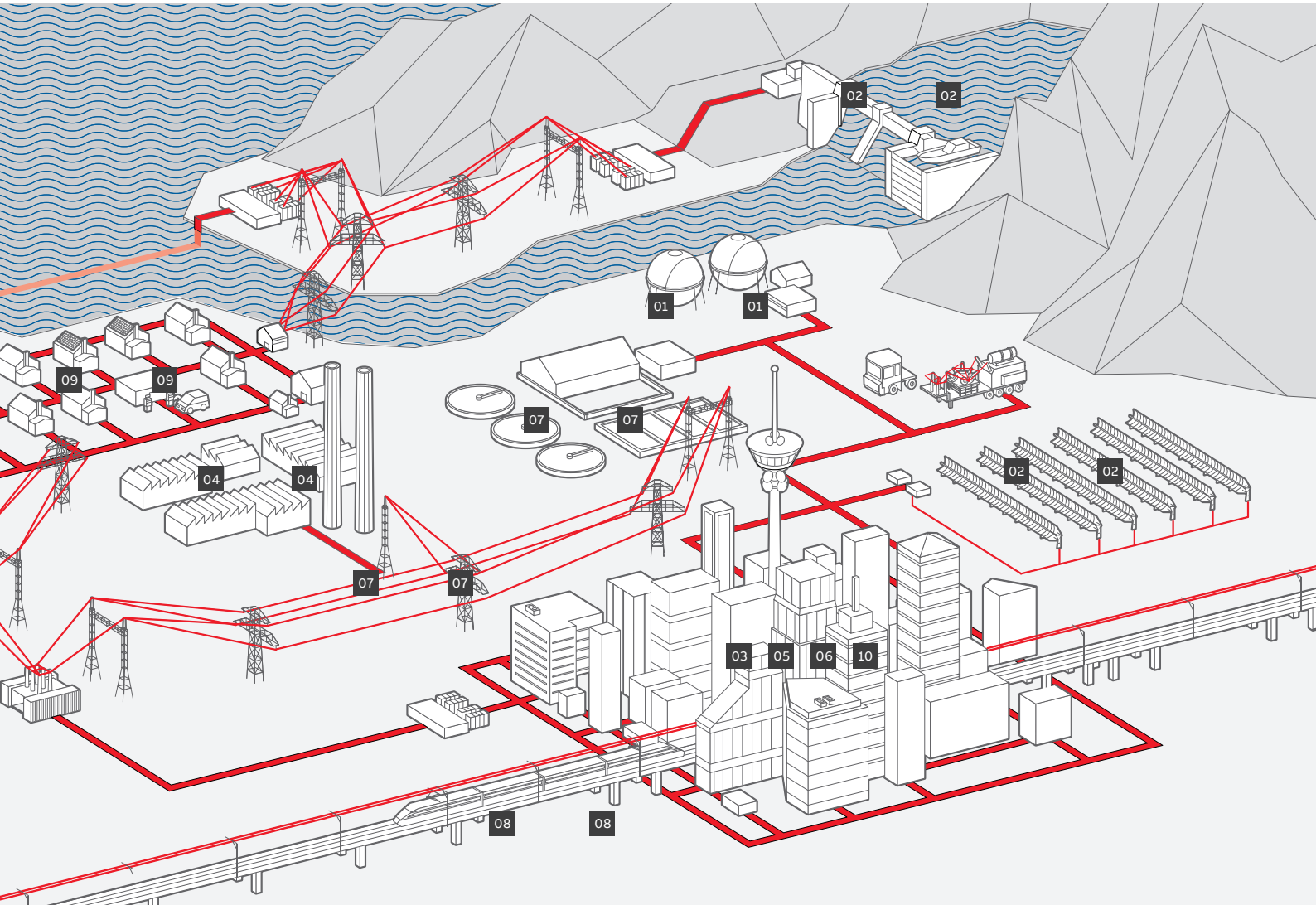
- **Government & public sector**
- Central government buildings
- Embassies & official residences
- Local authority premises
- Police stations
- Hospitals & healthcare facilities
- Technical colleges & universities

Rail & infrastructure
- National railways
- City metro & light rail systems
- Airports & airport terminal expansions
- Subsea tunnels

Sports & recreation
- Hotels & resorts
- Sports facilities & training grounds
- Theatres & opera houses
- Shopping malls

Residential
- High rise residential towers & apartment blocks
- Condominiums
- Housing development projects

Cultural & heritage
- Historical sites
- Mosques, churches & cathedrals
- National libraries
- Monuments



Introduction
Earthing

Earthing of the lightning protection system, as well as the electrical installation, is paramount for safety, to protect life, electrical equipment and critical electronics from electrical system faults and lightning currents.

In the vast majority of countries, this need for earthing is clearly stipulated through health and safety regulations, with implementation driven by approved standards.

These standards cover a wide range of situations, including earthing and equipotential bonding of:
- Lightning protection systems
- Low voltage electrical systems
- Telecommunications systems
- High voltage electrical systems (over 1 kVac)

Earthing is essentially the connection of the electrical system and connected electrical equipment, as well as the structural lightning protection system (where installed), to the general mass of earth using suitably sized conductor.

Equipotential bonding is the interconnection of all metalwork in a structure to ensure, in the event of a current passing to earth, there is no risk of arcing or electric shock hazard.

A good quality earthing system is designed to:
- Prevent risk to life, by removing the risk of electric shock
- Protect connected electrical and electronic equipment from damage due to the passage of fault, earth leakage or lightning currents
- Provide a low impedance path to earth, to ensure effective operation of overcurrent protective devices in the event of a fault
- Ensure connected equipment remains at the same electrical potential
- Remove risk of overheating of conductors under fault conditions so there is no risk of insulation breakdown
- Ensure people on or near substations are not at risk from step, touch or transfer potentials

It is essential for safety and business continuity. Poor quality earthing not only risks damage and downtime to equipment, but also the risk of electrocution and loss of life.

Earthing design
Power earthing design, especially for high voltage installations such as substations, is a complex process requiring assessment and understanding of local soil conditions, existing overhead/underground conductors and metalwork, and prospective earth fault current duration and magnitude at the installation.

Our technical team provides consultancy on such projects and undertakes high voltage earthing design using CDEGS software.

Designed earthing systems utilise our high quality copper earthing tapes, our earth rods, backfills, mechanical clamps and FurseWELD® exothermic welding system, to ensure a safe and long term earthing installation.

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01 Threaded copperbond earth rods.

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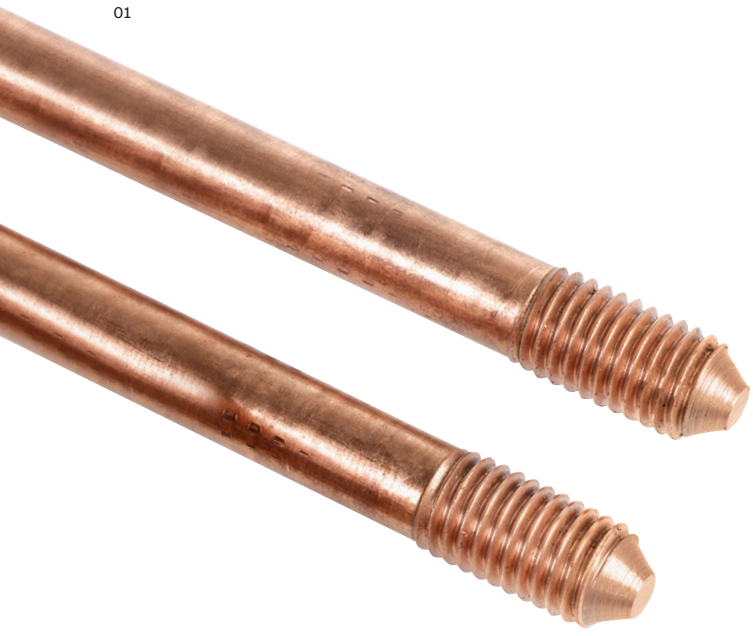
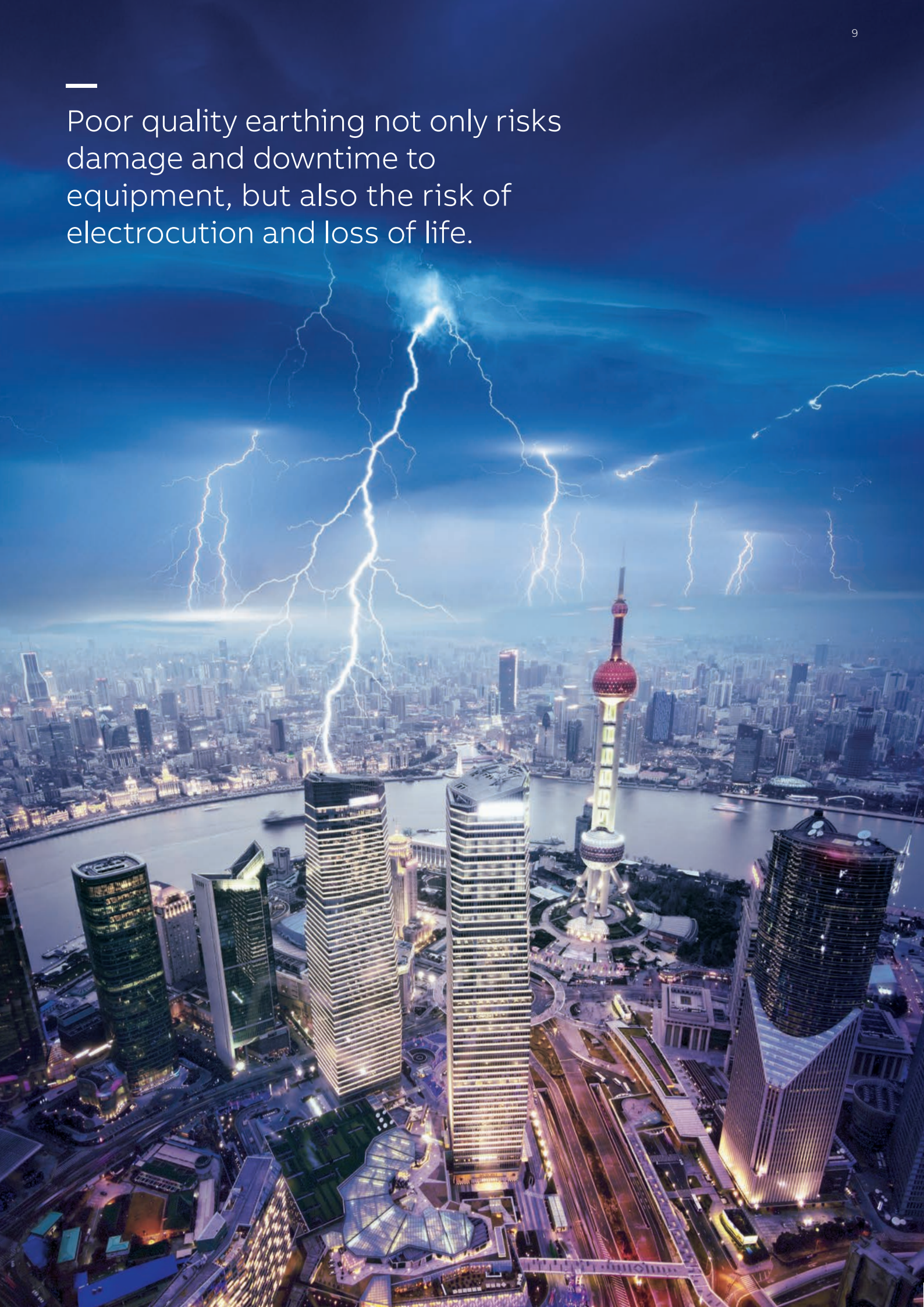


Poor quality earthing not only risks damage and downtime to equipment, but also the risk of electrocution and loss of life.



Introduction
Lightning protection & power earthing services

Our technical team has over 100 years' accumulated knowledge & experience of developing lightning protection and power earthing solutions, and designs systems to British and other recognised standards.

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01 Soil Resistivity Surveys.

Lightning protection services
The Furse technical team actively participates in the development of National and International standards for lightning protection, and offers the ideal starting point for customers confronted by the challenges found in complex lightning protection projects.

Our experienced engineers can provide support on all aspects of structural lightning protection and transient overvoltage protection, including:
- Risk assessment of structures in compliance with the latest standards
- Lightning protection system designs to meet client specifications

In order for us to design a structural and/or transient overvoltage lightning protection system, we need the following information:
- Design standard, e.g. BS EN 62305 (or other National Standard for 62305), IEC 62305, NFPA 780 or UL 96A
- A dimensioned roof plan & external elevations
- Construction details, e.g. steelwork, reinforced concrete, roofing materials, etc.
- A single line diagram indicating voltage and current for each electrical system, e.g. power, data, telephones, fire alarms, CCTV
- Details of essential equipment, e.g. network servers, PLC controllers

Power earthing services
Power earthing design of installations over 1 kVac is a specialist area of business, requiring in-depth understanding of the principles of electrical safety and key knowledge of a range of earthing standards. Our engineers can provide important guidance on power earthing, including:
- Power earthing system design
- Supply of comprehensive drawings
- Earth resistance measurement & soil resistivity surveys
- Earth modelling analysis

To design a power earth electrode system, we need the following information:
- Design standard, e.g. BS EN 50522, BS 7430, BS 7354, ANSI IEEE Std 80, EATS 41-24 etc.
- A dimensioned site plan and overall electrical single line diagram
- Soil resistivity survey results
- Earth fault current magnitude
- Earth fault current duration

Soil resistivity surveys
A comprehensive soil resistivity survey is key to creating an effective earthing system, as inadequate or erroneous soil resistivity readings are likely to result in a flawed design.

Earth modelling analysis
Earth modelling analysis uses state-of-the-art technology to determine the step and touch voltages, earth potential rise and hot/cold site classification of the site generated by the initial design.

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02 Improving knowledge and understanding of lightning protection and earthing is important to improve overall safety in the built environment.

Earthing and lightning protection is a progressive industry underpinned by an adherence to British, European and International standards, which determine both the design and implementation of systems, and the control of product quality.

These National and International standards are regularly updated making it important to keep abreast of latest developments.

Furthermore, given the complexity of these standards, confusion and misinterpretation can easily lead to project delays, budget overruns and costly extra time on site.

We aim to help customers to avoid these risks, fully supporting Furse product sales with high quality technical support.

We're here to help
We offer regular training seminars to improve understanding of earthing, lightning protection and transient overvoltage protection standards and practices.

Seminars are held at the ABB Furse Nottingham, UK office, and at other convenient locations/ customer premises - please contact your local ABB representative for further information.

Furse technical guidance
Primary in our supporting literature for lightning protection is the Furse Guide to IEC/BS EN 62305 - considered indispensable reading for anybody working in the lightning protection industry today.

Complete with easy to understand illustrations and design examples, this Guide helps to explain in clear and concise terms the requirements of IEC/BS EN 62305 and provides the reader with the necessary information to enable identification of all risks involved and to assess the required level of protection in accordance with this standard.

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Bank of England, UK.

Channel Tunnel Rail Link, UK.

Canary Wharf, London, UK.

Circle Line, Mass Rapid Transit System, Singapore.

Project references

Our Total Solution approach, which delivers innovative, high quality products supported by intelligent, concise technical support, makes Furse the brand of choice for many projects, in many markets, worldwide.

Oil & gas/Petrochemical
- Oil Fields in Toha, China
- Pertamenia Gas / Petrol Depot, Indonesia
- Asab Full Field Development, UAE
- Dorra Gas Field Development, Saudi Arabia
- Jubail Chevron Phillips (JCP)
- Petrochemical Plant, Saudi Arabia
- Barzan Camp & Gas Fields, Qatar

Utilities
- Waste Water Treatment Plant, Shoiba, Saudi Arabia
- JAFZA Desalination Plant, UAE
- Hammas Power Station, Algeria
- Shuwaikh Desalination Plant, Kuwait
- Tianwan Nuclear Power Plant, China
- Mombassa Substation, Kenya
- Kapichira Hydo-Power Station, Malawi
- Hinkley Point Power Station, UK

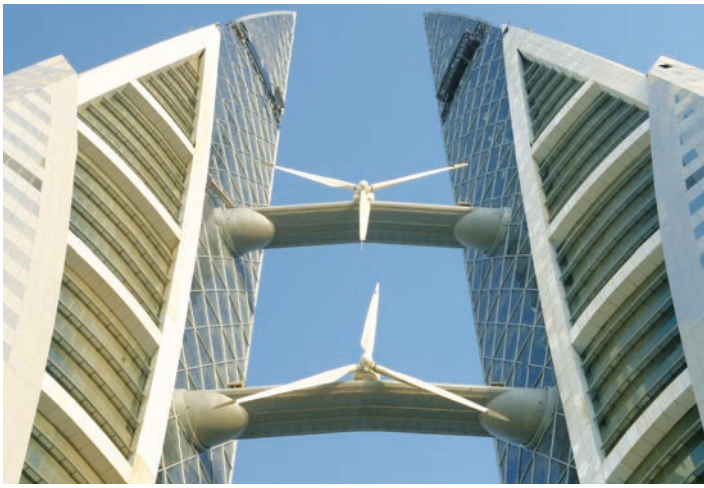
Rail & infrastructure
- Kuwait Int. Airport
- Shanghai Metro, China
- Kowloon Rail Link, Hong Kong
- New Terminal, Seeb Airport, Oman
- Circle Line, Mass Rapid Transit System, Singapore
- King Abdul Aziz In. Airport
- Cairo monorail, Egypt
- Haramain Railway Station, Saudi Arabia

Military
- Kazma Camp, Kuwait
- Alexander Barracks, Cyprus
- Dukham Airbase, Qatar
- Rafo Airbase, Oman

Heathrow Airport, London, UK.

Kuala Lumpur Stock Exchange, Malaysia.

British Library, London. UK.



Financial Towers, Bahrain.

High tech & industrial
- Taiwan Semiconductor Manufacturing Corporation, China
- China Telecom
- Intel Plant, High Tech Kulim, Malaysia
- Kuala Lumpur Telecoms Tower, Malaysia
- Seagate Semiconductor Plant, Singapore
- Alexandra Technopark, Singapore
- Motorola Factories, Singapore
- Najran Cement Factory, Saudi Arabia
- Merck, Sharp & Dohme Pharmaceutical Plant, Singapore
- Alfred McAlpine Quarry Products, UK

Commercial construction
- Bahrain Financial Harbour
- Emirates Towers, Bahrain
- Petronas Twin Towers, Malaysia
- Oman Arab Bank, Oman
- Kuala Lumpur Stock Exchange, Malaysia
- Graha Energy Building, Indonesia
- Canary Wharf, London, UK
- Highland Distilleries Co plc, UK
- Barwa Financial District, Qatar
- London Stock Exchange
- Iconic Tower, Egypt

Sports & recreation
- World Cup Stadium, Qatar.
- Geordano Mall, Qatar
- Bahrain Opera House, Bahrain
- The Grand Egyptian Museum, Egypt
- Disneyland Hong Kong
- Sebang International Formula One Circuit, Malaysia
- Manchester United Training Ground, UK
- Grand Plaza Hotel, Singapore
- Dubai Sports City Complex, UAE
- Mall of Oman, Oman

Government & public sector
- Royal College of Surgeons, Muharraq, Bahrain
- Ministry of Foreign Affairs, Brunei
- Singapore Embassy, China
- Prime Minister's Office, Putrajaya, Malaysia
- University Institute of Technology, Ijok-Selangor, Malaysia
- Ministry of Finance Administrative Building, Malaysia
- Mater Dei General Hospital, Malta
- International Maritime College, Oman
- Al Jaber Hospital, Kuwait
- British Library, London, UK
- Aster Royal Hospital, Oman
- Expo Pavilions 2020, UAE

Lightning protection
Introduction

When designing a structural lightning protection system using the Faraday Cage principle advocated by IEC/BS EN 62305, it is possible to use one or more types of conductor, such as flat tape, solid circular or cable and wire (stranded).

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01 Copper tape system.
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02 Copper solid circular system.
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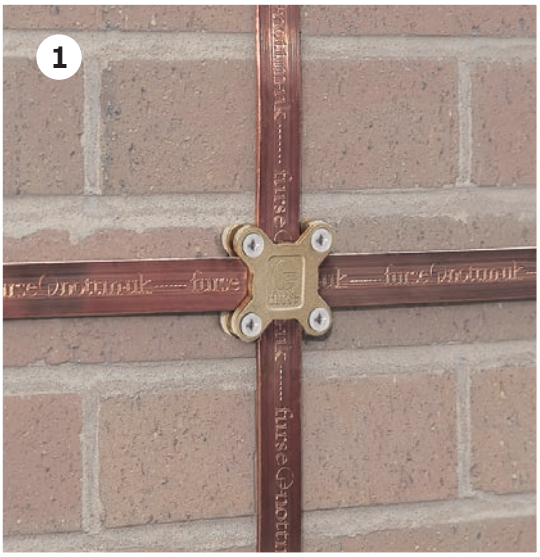
03 Copper cable & wire system.



The decision about which type to use is often based more on country-specific historical preferences or aesthetic considerations than the superiority of one type over another. High quality Furse conductors, plus appropriate fittings, are available for all three systems.

Flat tape conductor system
Flat tape conductors are easy to install, with no need to straighten for a neat finish. Available in copper or aluminium, flat tape can be installed bare or with a choice of PVC coverings, to enable the tape to blend with modern building fabrics.

Tinned copper tape is also available for applications that require additional protection measures, and copper braid is available for use where flexibility is necessary, e.g. on moving installations like gates or doors.

Furse copper tape is manufactured to BS EN 13601, whilst Furse aluminium tape is manufactured to BS EN 755-5.

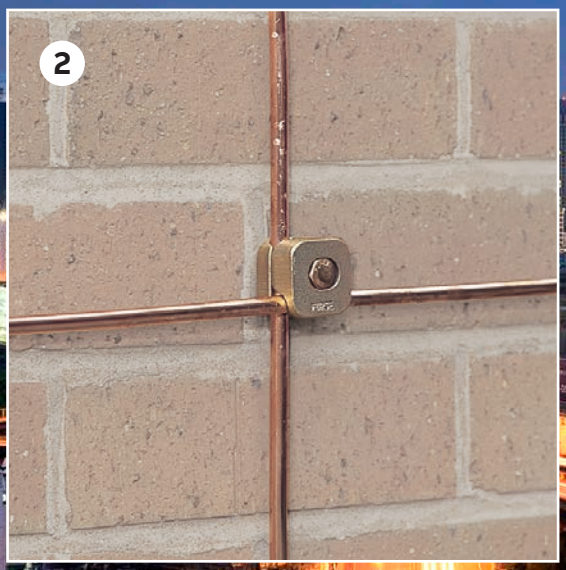
Solid circular conductor system
Solid circular conductors can be used in applications where aesthetic considerations are important.

The 8 mm diameter solid circular range is less conspicuous than the flat tape system, and lends itself much better to being concealed. Available in copper or aluminium, solid circular conductors. A coil of circular conductor can be quickly installed, being easy to bend in any plane, and only needing a straightening tool to give a very neat finish.

Furse copper solid circular conductor is manufactured to BS EN 13601, whilst Furse aluminium solid circular conductor is manufactured to BS EN 755-5.

Stranded conductor system
The Furse range of soft drawn stranded conductors is available in copper, either bare or PVC insulated.

The Furse range of conductors is complemented by a complete range of fittings, including clips, clamps, holdfasts and bimetallic connectors.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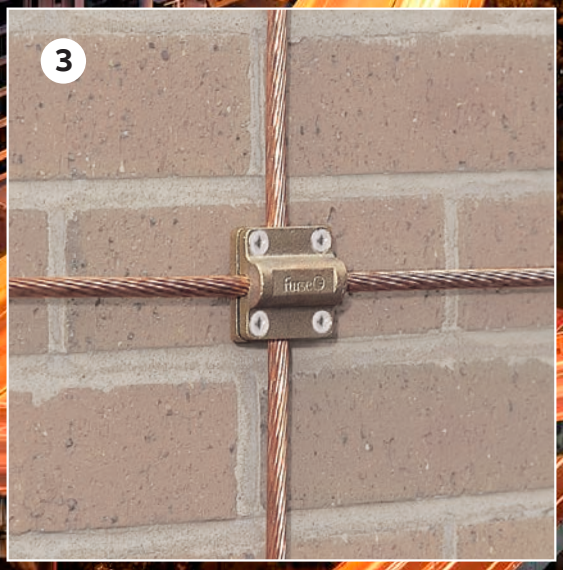
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Introduction to lightning protection
Product selection guide

Conductors

The first choice faced by the designer of a structural lightning protection system is the type of conductor system to be used:
- Choose the material required, i.e. copper or aluminium
- Choose the type of conductor required, i.e. flat tape, solid circular or stranded

1. Conductor network
The conductor network is the means of intercepting/carrying the current of a lightning strike safely to the earth termination network. Use the guidelines of IEC/BS EN 62305-1 & -3 for the correct placement of conductors.

2. Fixings
Select the correct system of fixings for each part of the conductor system. Fixings are available for a wide range of modern construction materials, e.g. brick, stone, plastic and metal.

Air termination network

The air termination network is the point of connection for a lightning strike. It typically consists of a meshed conductor arrangement covering the roof of the structure. The mesh size is determined by Lightning Protection Level - LPL.

3. Air terminals
Use air terminals in the form of vertical air rods for the protection of prominent roof top features or equipment. Use strike pads to connect and thus expose concealed conductors.

4. Air rod bases
Choose the correct air rod base. This will ensure that the vertical air rods are both solidly fixed to the fabric of the structure and have a low resistance connection to the conductor network.

5. Interconnection components
Crossover clamps have been specially designed for use where conductors cross as part of a roof network.

Down conductor network

6. Conductor jointing clamps
Select a component for the interconnection of multiple conductors or for changes of direction. Jointing clamps will ensure a low resistance, corrosion resistant connection between air termination and down conductors.

7. Test clamps
In order to allow periodic disconnection and testing of the earth termination network, select a test clamp to be placed within the run of each down conductor.

Earth termination network

The means of dissipating the current to the general mass of earth.

8. Earth electrodes
Choose an earth electrode to suit the system design i.e. Type A, Type B or foundation electrode. Electrodes can be constructed individually from earth rods, earth plates, flat tape, stranded cable or any combination of these.

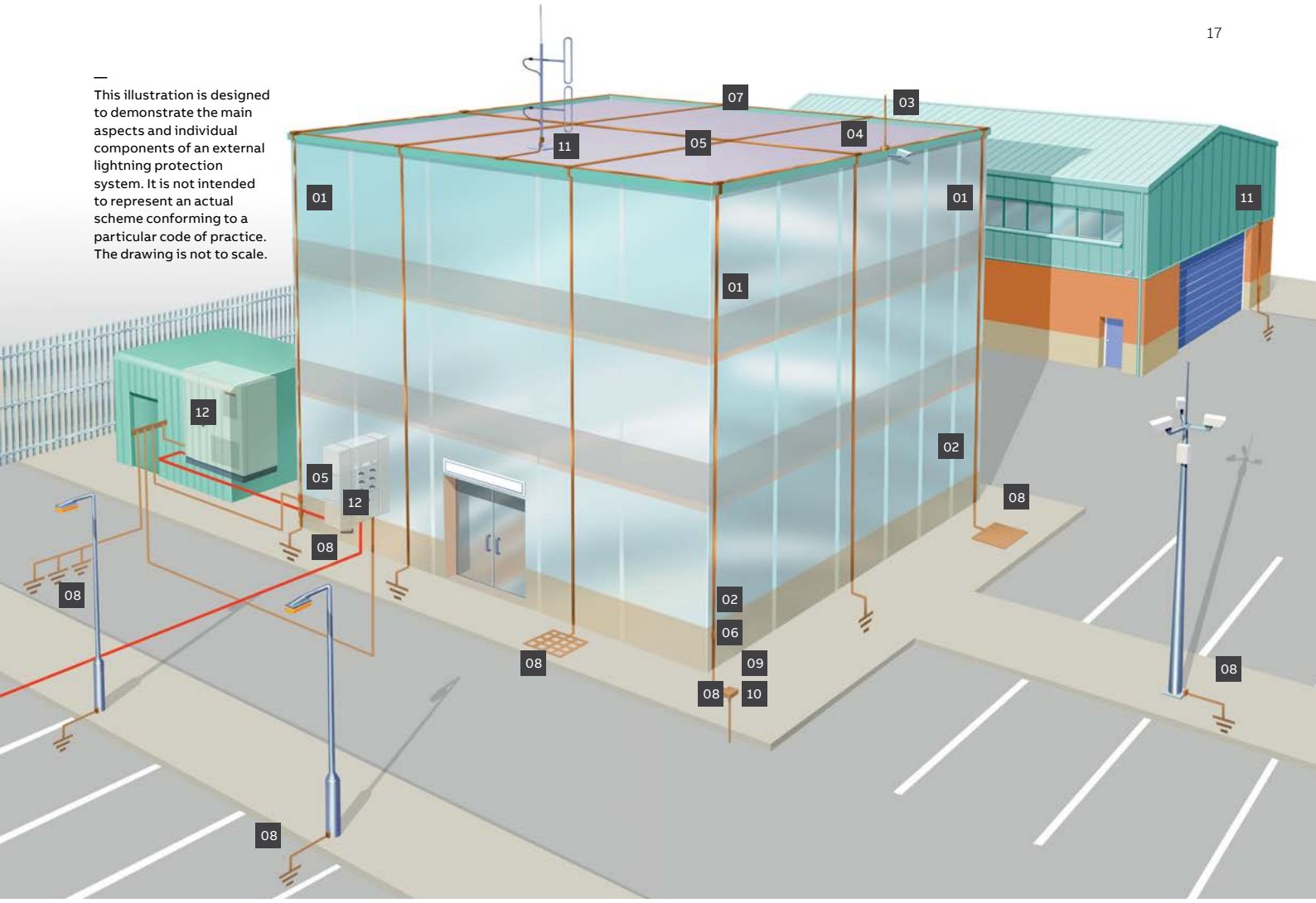
9. Earth rod clamps
Select a high copper content alloy earth rod clamp for the connection of the earthing conductor to the earth rod. In this below ground application, the clamp must ensure a good electrical contact and resist corrosion throughout the lifetime of the installation.

10. Earth inspection pits
Select an earth inspection pit to protect the earth electrode connections. High strength pits are available in plastic and concrete.

Equipotential bonding

Bonding is the most commonly employed method of avoiding the damaging effects of side flashing. All continuous metalwork should be considered for bonding. All metallic services, e.g. cable armouring, gas, water or steam piping, entering the building should also be bonded as directly as possible to the earth termination network.

This illustration is designed to demonstrate the main aspects and individual components of an external lightning protection system. It is not intended to represent an actual scheme conforming to a particular code of practice. The drawing is not to scale.



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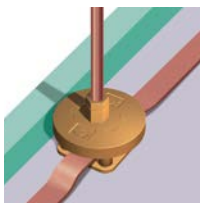

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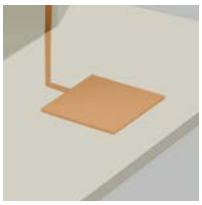

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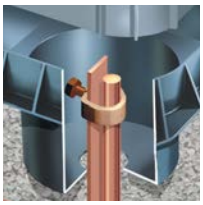

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Product selection guide - Lightning protection

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11. Bonds to metalwork
Select the correct type of metalwork bond for the application, i.e. a flat column face, a circular rainwater pipe or a ribbed reinforcing bar.

12. Surge Protective Devices (SPDs)
Designed to prevent dangerous sparking caused by flashover, lightning current or equipotential bonding SPDs must be fitted to all metallic service lines with ‘live cores’ entering or leaving the structure.

Conductors
Introduction

By far the largest and most important component of any structural lightning protection or earthing system is the actual conductor.

Selection of the correct conductor type for the installation is highly important, and is likely to be the initial consideration of a lightning protection or earthing system designer.

A comprehensive range of Furse copper and aluminium conductors are available in each of the main globally recognised standard formats, i.e. flat tape, solid circular and stranded (note, copper stranded only). Additionally each format is available in a variety of conductor sizes, to meet differing lightning protection and earthing requirements.

Specification will depend on whether the application is for an above ground structural lightning protection system, or a below ground earthing installation.

Conductors for structural lightning protection systems
Furse lightning protection conductors are available in copper and aluminium. Copper can be supplied bare, tinned, PVC, LSOH and lead covered. It is used for most installations due to its high conductivity, anticorrosive properties, and its flexibility for use in air, in earth and in concrete. Aluminium can be supplied bare or with PVC coating.

The following sizes are suitable for the majority of above ground lightning protection systems:

- **Flat tape conductor**
  25 x 3 mm bare tape, or 25 x 3 mm PVC covered tape
- **Solid circular conductor**
  8 mm diameter bare or PVC covered solid circular conductor
- **Stranded conductor**
  95/70 mm² bare or PVC covered stranded conductor

Conductor colour chart

Colour	Standard
Black	RAL 9005 / 00E53*
Green	BS 6746C
Grey	00A07*
Dark Grey	18B29*
Stone	08B23*
White	10B15*
Brown	06C39*

*PVC colours to BS 5252.

Conductor colour chart
The choice of a lightning protection conductor is usually governed by its aesthetic impact on the structure to be protected. For many people the term lightning protection conductor conjures up an image of a discoloured copper strip running down the spire of a church. This would clearly be unacceptable to the owner/architect of a modern structure.

In order to reduce the impact of an external system Furse offer a range of UV stabilized PVC covered tapes and solid circular conductors in colours chosen to match most common building materials.

Standard PVC colours are shown in the chart above, with special colours available to order.

Conductors for earthing systems
For below ground earthing applications we offer a large range of bare copper tape, solid circular and stranded conductors thus offering the designer of the system the correctly rated conductor without the need to oversize.

These conductors provide either the connection to a final earth electrode (earth rod or plate), or the earth electrode itself (earth grid or ring earth arrangement).

An earth conductor must be capable of carrying the maximum expected earth fault current and leakage current likely to occur at a structure. The size or minimum cross-sectional area of the conductor must therefore be gauged in accordance with these criteria.

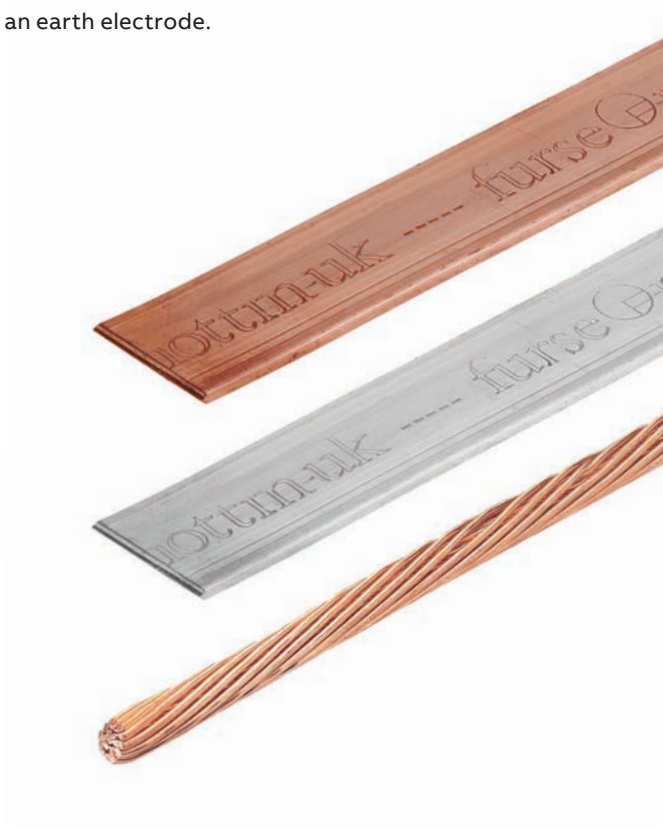
—
Earth conductors

Conductor Size (mm)	C.S.A. (mm^2)	kA for 1 Sec	kA for 3 Sec
20 x 1.5	30	5.3	3.0
20 x 3	60	10.6	6.1
25 x 1.5	37.5	6.6	3.8
25 x 3	75	13.2	7.6
25 x 2	50	8.8	5.1
25 x 4	100	17.6	10.2
25 x 6	150	26.4	15.2
30 x 3	90	15.8	9.1
30 x 4	120	21.1	12.2
30 x 5	150	26.4	15.2
31 x 3	93	16.4	9.5
31.5 x 4	126	22.2	12.8
31 x 6	186	32.7	18.9
38 x 3	114	20.1	11.6
38 x 5	190	33.4	19.3
38 x 6	228	40.1	23.2
40 x 3	120	21.1	12.2
40 x 4	160	28.2	16.3
40 x 5	200	35.2	20.3
40 x 6	240	42.2	24.4
50 x 3	150	26.4	15.2
50 x 4	200	35.2	20.3
50 x 5	250	44.0	25.4
50 x 6	300	52.8	30.5
50 x 7	350	61.6	35.5
50 x 8	400	70.4	40.6
75 x 6	450	79.2	45.7

These conductor ratings are based upon the recommendations of BS 7430 with an initial conductor temperature of 30°C and a maximum temperature of 250°C.

A good earth conductor must also:
- Be able to withstand mechanical damage
- Be compatible with the material of the earth electrode
- Resist the corrosive effect of local soil conditions

Furse conductors effectively meet these requirements and are available in a range of sizes to meet differing current ratings (see table left). Copper conductor is recommended as following BS 7430, aluminium should not be installed in contact with soil, nor in damp areas, and it should not be used to make the final connection to an earth electrode.

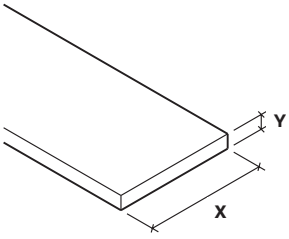


Conductors

Bare conductors

Bare copper tape

Part no.	ABB order code	Conductor size X x Y (mm)	Standard coil size (m)	Weight per metre (kg)	Certification/ standards
TC015	7TCA083010R0054	20 x 1.5	100	0.27	●
TC020	7TCA083010R0060	20 x 3	50	0.53	●
TC020/100	7TCA083010R0061	20 x 3	100	0.53	●
TC026-FU	7TCA083010R0072	25 x 2	50	0.45	●
TC030	7TCA083010R0081	25 x 3	25	0.67	● ●
TC030/50	7TCA083010R0097	25 x 3	50	0.67	●
TC030-UL	7TCA083010R0082	1" x 1/8"	25	0.67	● ●
TC035	7TCA083010R0127	25 x 4	50	0.89	●
TC040	7TCA083010R0144	25 x 6	40	1.33	●
TC042	7TCA083010R0155	30 x 3	50	0.80	●
TC044	7TCA083010R0167	30 x 4	40	1.07	●
TC043-FU	7TCA083010R0697	30 x 5	40	1.33	●
TC045	7TCA083010R0174	31 x 3	50	0.83	●
TC048	7TCA083010R0177	31.5 x 4	40	1.13	●
TC050	7TCA083010R0185	31 x 6	30	1.65	●
TC055	7TCA083010R0191	38 x 3	50	1.01	●
TC060-FU	7TCA083010R0198	38 x 5	30	1.69	●
TC065	7TCA083010R0209	38 x 6	25	2.02	●
TC067	7TCA083010R0241	40 x 3	40	1.06	●
TC066	7TCA083010R0217	40 x 4	30	1.42	●
TC071	7TCA083010R0272	40 x 5	25	1.78	●
TC068	7TCA083010R0250	40 x 6	25	2.16	●
TC070	7TCA083010R0265	50 x 3	40	1.33	●
TC075	7TCA083010R0279	50 x 4	30	1.78	●
TC078	7TCA083010R0292	50 x 5	20	2.22	●
TC080	7TCA083010R0294	50 x 6	20	2.68	● ●
TC090	7TCA083010R0324	50 x 7	10	3.08	●
TC092	7TCA083010R0642	50 x 8	10	3.56	●
TC093	7TCA083010R0679	75 x 6	10	4.00	●



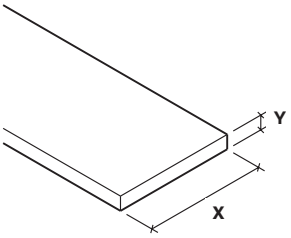
Certification / Standards: ● BS EN 13601 / ● IEC/BS EN 62561-2 / ● UL 96.
All bare copper tape sold in full coil lengths only.
High conductivity annealed copper tape.

Conductors

Bare & tinned conductors

Bare aluminium tape

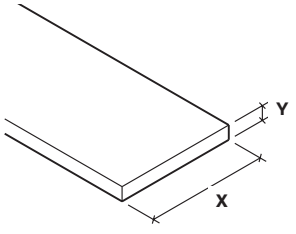
Part no.	ABB order code	Conductor size X x Y (mm)	Standard coil size (m)	Weight per metre (kg)	Certification/ standards
TA020	7TCA083040R0006	20 x 3	50	0.17	●
TA030	7TCA083040R0011	25 x 3	50	0.21	● ●
TA040	7TCA083040R0020	25 x 6	50	0.42	●
TA042	7TCA083040R0022	30 x 3	50	0.25	●
TA068	7TCA083040R0023	40 x 6	50	0.67	●
TA080	7TCA083040R0030	50 x 6	50	0.85	●



Certification / Standards: ● BS EN 755-5 / ● IEC/BS EN 62561-2.
All bare aluminium tape sold in full coil lengths only.

Tinned copper tape

Part no.	ABB order code	Conductor size X x Y (mm)	Standard coil size (m)	Weight per metre (kg)	Certification/ standards
TC220	7TCA083030R0173	20 x 3	50	0.53	●
TC230	7TCA083030R0030	25 x 3	50	0.67	● ●
TC230-UL	7TCA083030R0034	1” x 1/8”	50	0.67	● ●
TC239	7TCA083030R0063	30 x 2	50	0.53	●
TC240	7TCA083030R0075	25 x 6	40	1.33	●
TC245	7TCA083030R0091	31 x 3	50	0.83	●
TC260	7TCA083030R0098	38 x 5	30	1.69	●
TC266	7TCA083030R0101	40 x 4	30	1.42	●
TC280	7TCA083030R0120	50 x 6	20	2.68	●



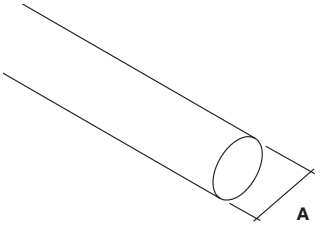
Certification / Standards: ● BS EN 13601 / ● IEC/BS EN 62561-2 / ● UL 96.
All tinned copper tape sold in full coil lengths only.
High conductivity annealed tinned copper tape.

Conductors

Bare solid circular & stranded conductors

Bare solid circular

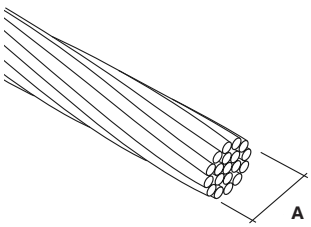
Part no.	ABB order code	Diameter A (mm)	Cross-sectional area (mm²)	Standard coil size (m)	Weight per metre (kg)	Certification/ standards
Copper conductor						
CD035	7TCA083060R0000	Ø8	50.27	50	0.44	●
Aluminium conductor						
CD080	7TCA083820R0000	Ø8	50.27	50	0.12	●
Tinned copper conductor						
CD235	7TCA083060R0015	Ø8	50.27	50	0.44	●



Certification / Standards: ● BS EN 13601 / ● BS EN 755-5.
All solid circular conductor sold in full coil lengths only.

Bare stranded copper cable

Part no.	ABB order code	Cross-sectional area (mm²)	Stranding no. /mm ø	Diameter A (mm)	Weight per metre (kg)	Certification/ standards
Soft drawn stranded copper cable						
CB016	7TCA083080R0001	16	7/1.70	Ø5.10	0.15	●
CB025	7TCA083080R0002	25	7/2.14	Ø6.42	0.23	●
CB035	7TCA083080R0003	35	7/2.52	Ø7.56	0.32	●
CB050-FU	7TCA083080R0004	50	19/1.78	Ø8.90	0.43	●
CB070	7TCA083080R0005	70	19/2.14	Ø10.70	0.62	●
CB095	7TCA083080R0008	95	19/2.52	Ø12.60	0.86	●
CB120-FU	7TCA083080R0009	120	37/2.03	Ø14.21	1.09	●
CB150-FU	7TCA083080R0010	150	37/2.25	Ø15.75	1.33	●
CB185	7TCA083080R0011	185	37/2.52	Ø17.64	1.67	●
CB240-FU	7TCA083080R0041	240	61/2.25	Ø20.25	2.20	●
CB300-FU	7TCA083080R0013	300	61/2.52	Ø22.68	2.76	●
CB400-FU	7TCA083080R0027	400	61/2.85	Ø25.65	3.53	●
Hard drawn stranded copper cable						
CB071*	7TCA083080R0007	70	7/3.55	Ø10.70	0.64	●



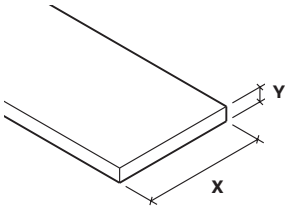
Certification / Standards: ● BS EN 60228 / ● BS 7884.
*Additional sizes available on request.
Tinned soft drawn stranded copper cable available on request.
Note: bare stranded copper cable supplied unbranded.

Conductors

Hard drawn bar & flexible braid

Hard drawn copper bar

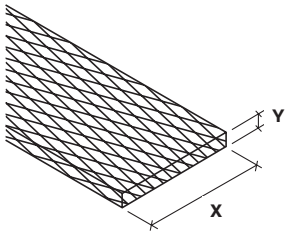
Part no.	ABB order code	Overall nominal size X x Y (mm)	Approximate length (m)	Weight per metre (kg)	Certification/ standards
BA205	7TCA083810R0000	25 x 3	3	0.67	●
BA210	7TCA083810R0002	25 x 6	4	1.33	●
BA225	7TCA083810R0004	38 x 6	4	2.03	●
BA230	7TCA083810R0005	50 x 6	3	2.67	●
BA235	7TCA083810R0008	50 x 10	4	4.45	●
BA240	7TCA083810R0009	75 x 6	4	4.00	●
BA250-FU	7TCA083810R0010	100 x 6	4	5.38	●



Certification / Standards: ● BS EN 12163.
Tinned copper variants available to special order.
Note: hard drawn copper bar supplied unbranded.

Flexible flat copper braid

Part no.	ABB order code	Overall nominal size X x Y (mm)	Cross-sectional area (mm²)	Weight per metre (kg)	Certification/ standards
Bare flat braid					
BD028	7TCA083070R0334	25 x 3	25	0.25	●
BD030	7TCA083070R0005	25 x 3.5	35	0.34	●
BD031	7TCA083070R0362	30 x 5	50	0.49	●
Tinned flat braid					
BD028-T	7TCA083070R0335	25 x 3	25	0.25	●
BD035	7TCA083070R0006	25 x 3.5	35	0.34	●
BD031-T	7TCA083070R0276	30 x 5	50	0.49	●



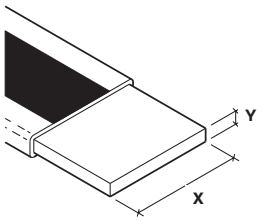
Certification / Standards: ● BS EN 13602.
Suitable for earth bonding. Also supplied as standard pre-cut and drilled bonds.
Other sizes and types of braid can be made to order. Please contact us for details.
Circular braid in a range of cross-sectional areas can be provided on request. Please contact us for details.
Note: flexible copper braid supplied unbranded.

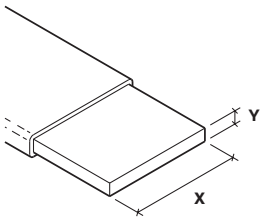
Conductors

PVC covered conductors

PVC covered copper tape

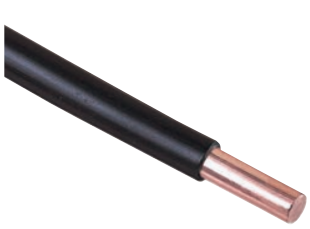
Part no.	ABB order code	Conductor size X & Y (mm)	Standard coil size (m)	Weight per metre (kg)	Colour range	Certification/ standards
TC105-FU	7TCA083020R0038	25 x 3	25	0.77	Black	● ●
TC105/50	7TCA083020R0039	25 x 3	50	0.77	Black	● ●
TC110	7TCA083020R0044	25 x 3	25	0.77	Green	● ●
TC110/50	7TCA083020R0045	25 x 3	50	0.77	Green	● ●
TC111-FU	7TCA083020R0053	25 x 3	25	0.79	Green & yellow	● ●
TC111/50	7TCA083020R0057	25 x 3	50	0.79	Green & yellow	● ●
TC115-FU	7TCA083020R0061	25 x 3	25	0.77	Grey	● ●
TC115/50	7TCA083020R0062	25 x 3	50	0.77	Grey	● ●
TC116-FU	7TCA083020R0067	25 x 3	50	0.77	Dark grey	● ●
TC116/25	7TCA083020R0068	25 x 3	25	0.77	Dark grey	● ●
TC120-FU	7TCA083020R0069	25 x 3	25	0.77	Stone	● ●
TC120/50	7TCA083020R0070	25 x 3	50	0.77	Stone	● ●
TC125-FU	7TCA083020R0076	25 x 3	25	0.77	White	● ●
TC125/50	7TCA083020R0077	25 x 3	50	0.77	White	● ●
TC130	7TCA083020R0083	25 x 3	25	0.77	Brown	● ●
TC130/50	7TCA083020R0084	25 x 3	50	0.77	Brown	● ●
TC140-FU	7TCA083020R0092	25 x 6	40	1.53	Green	● ●
TC145	7TCA083020R0099	50 x 6	20	2.95	Green	● ●



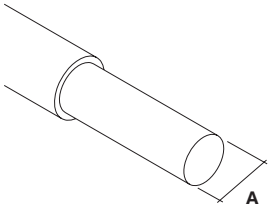


Certification / Standards: ● BS EN 13601 (copper) / ● BS 5252 (PVC colour) / ● BS 6746C (PVC colour).
Every precaution has been taken to ensure the UV stability of PVC coverings, but as with all plastics, colour variation will occur over time.
All PVC covered copper tape sold in full coil lengths only.
High conductivity annealed copper tape.

PVC covered copper solid circular



Part no.	ABB order code	Diameter A (mm)	Cross-sectional area (mm²)	Standard coil size (m)	Weight per metre (kg)	Colour range	Certification/ standards
CD036	7TCA083060R0005	Ø8	50.27	50	0.49	Black	● ●
CD038	7TCA083060R0008	Ø8	50.27	50	0.49	Grey	● ●
CD039	7TCA083060R0009	Ø8	50.27	50	0.49	Stone	● ●
CD040	7TCA083060R0010	Ø8	50.27	50	0.49	White	● ●
CD041	7TCA083060R0013	Ø8	50.27	50	0.49	Brown	● ●

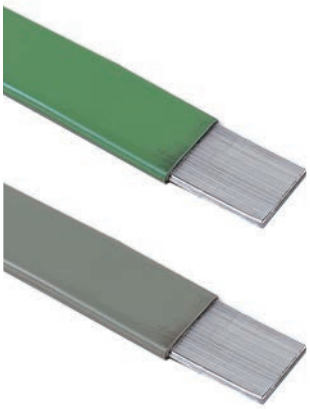


Certification / Standards: ● BS EN 13601 (copper) / ● BS 5252 (PVC colour).
Every precaution has been taken to ensure the UV stability of PVC coverings, but as with all plastics, colour variation will occur over time.
All PVC covered copper solid circular sold in full coil lengths only.

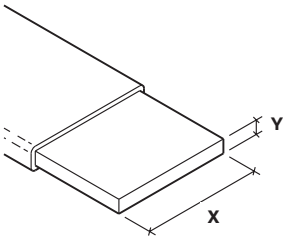
Conductors

PVC covered conductors

PVC covered aluminium tape



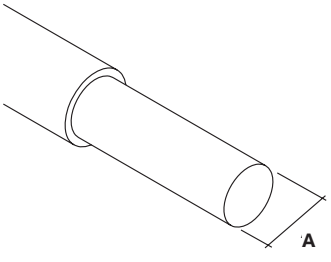
Part no.	ABB order code	Conductor size X & Y (mm)	Standard coil size (m)	Weight per metre (kg)	Colour range	Certification/ standards
TA105	7TCA083050R0008	25 x 3	50	0.30	Black	● ●
TA110	7TCA083050R0011	25 x 3	50	0.30	Green	● ●
TA115	7TCA083050R0015	25 x 3	50	0.30	Grey	● ●
TA116	7TCA093050R0019	25 x 3	50	0.30	Dark grey	● ●
TA120	7TCA083050R0020	25 x 3	50	0.30	Stone	● ●
TA125	7TCA083050R0023	25 x 3	50	0.30	White	● ●
TA130	7TCA083050R0030	25 x 3	50	0.30	Brown	● ●
TA140	7TCA083050R0035	25 x 6	40	0.63	Green	● ●



Certification / Standards: ● BS EN 755-5 (aluminium) / ● BS 5252 (PVC colour) / ● BS 6746C (PVC colour).
Every precaution has been taken to ensure the UV stability of PVC coverings, but as with all plastics, colour variation will occur over time.
All PVC covered aluminium tape sold in full coil lengths only.

PVC covered aluminium solid circular

Part no.	ABB order code	Diameter A (mm)	Cross-sectional area (mm²)	Standard coil size (m)	Weight per metre (kg)	Colour range	Certification/ standards
CD081	7TCA083820R0001	Ø8	50.27	50	0.18	Black	● ●
CD083	7TCA083820R0002	Ø8	50.27	50	0.18	Grey	● ●
CD084	7TCA083820R0003	Ø8	50.27	50	0.18	Stone	● ●
CD085	7TCA083820R0004	Ø8	50.27	50	0.18	White	● ●
CD086	7TCA083820R0005	Ø8	50.27	50	0.18	Brown	● ●



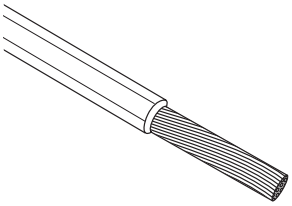
Certification / Standards: ● BS EN 755-5 (aluminium) / ● BS 5252 (PVC colour).
Every precaution has been taken to ensure the UV stability of PVC coverings, but as with all plastics, colour variation will occur over time.
All PVC covered aluminium solid circular sold in full coil lengths only.

Conductors

PVC insulated stranded conductor

Green & yellow PVC insulated stranded copper cable

Part no.	ABB order code	Cross-sectional area (mm²)	Stranding no. / Ø(mm)	Weight per metre (kg)	Certification/ standards
CC016	7TCA083090R0004	16	7/1.70	0.19	● ● ●
CC025	7TCA083090R0005	25	7/2.14	0.29	● ● ●
CC035	7TCA083090R0006	35	7/2.52	0.41	● ● ●
CC050	7TCA083090R0007	50	19/1.78	0.53	● ● ●
CC070	7TCA083090R0009	70	19/2.14	0.73	● ● ●
CC095	7TCA083090R0010	95	19/2.52	1.00	● ● ●
CC120-FU	7TCA083090R0011	120	37/2.03	1.27	● ● ●
CC150-FU	7TCA083090R0012	150	37/2.25	1.54	● ● ●
CC185	7TCA083090R0013	185	37/2.52	2.01	● ● ●
CC240	7TCA083090R0014	240	61/2.52	2.49	● ● ●
CC300	7TCA083090R0015	300	61/2.52	3.05	● ● ●
CC400-FU	7TCA083090R0016	400	61/2.85	3.90	● ● ●

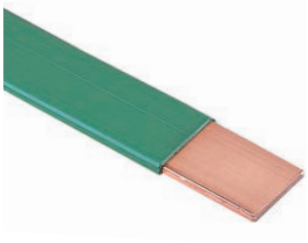


Certification / Standards: ● BS EN 50525 (copper) / ● BS 6746C (PVC colour) / ● BS 6004.
Note: Green & yellow PVC insulated stranded copper cable is supplied unbranded.

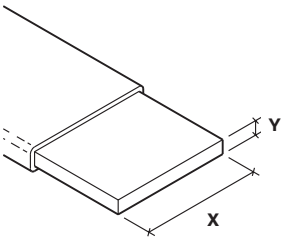
Conductors

LSOH & Lead covered conductors

Green LSOH covered copper tape

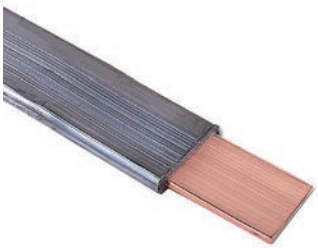


Part no.	ABB order code	Conductor size X & Y (mm)	Standard coil size (m)	Weight per metre (kg)	Certification/ standards
TC910	7TCA083020R0107	25 x 3	25	0.77	● ●
TC910/50	7TCA083020R0108	25 x 3	50	0.77	● ●
TC940	7TCA083020R0113	25 x 6	40	1.53	● ●
TC980	7TCA083020R0115	50 x 6	20	2.95	● ●

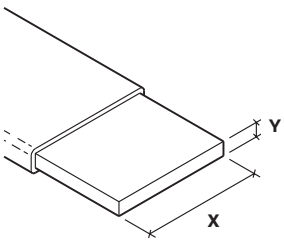


Certification / Standards: ● BS EN 13601 (copper) / ● BS 6746C (LSOH).
All Green LSOH covered copper tape sold in full coil lengths only.

Lead covered copper tape



Part no.	ABB order code	Conductor size (X x Y) (mm)	Standard coil size (m)	Weight per metre (kg)	Certification/ standards
TC330	7TCA083030R0125	25 x 3	25	2.56	●



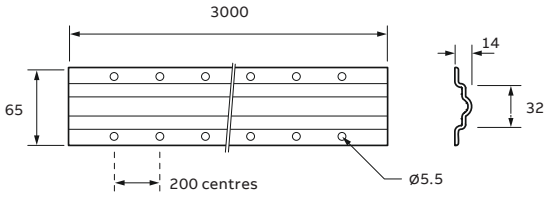
Certification / Standards: ● BS EN 13601 (copper).
All lead covered copper tape sold in full coil lengths only.

Conductors

Conductor guards

PVC protective down conductor guard

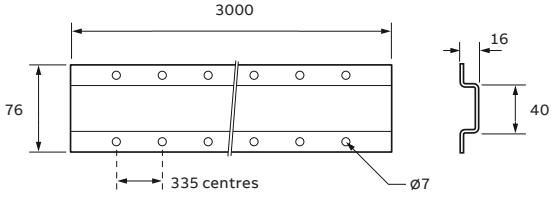
Part no.	ABB order code	Length (mm)	Weight per metre (kg)	Colour range
GC205	7TCA083870R0780	3,000	2.27	Black
GC215	7TCA083870R0781	3,000	2.27	Grey
GC220	7TCA083870R0782	3,000	2.27	Stone
GC225	7TCA083870R0783	3,000	2.27	White
GC230	7TCA083870R0784	3,000	2.27	Brown



Protects against vandalism and opportunity theft.
High impact PVC, UV stabilized to reduce colour degradation.
Suitable to protect bare and PVC covered 25 x 3 mm flat tape, Ø8 mm solid circular and 50 mm² stranded cable.
Fix using roundhead wood screws (Part no. SW405) and wall plugs (PS305).
Note: Conductor guard supplied unbranded.

Anti-vandal down conductor guard

Part no.	ABB order code	Material	Length (mm)	Weight per metre (kg)
AV005	7TCA083870R0018	Galvanised steel	3,000	2.90



Protects against vandalism and opportunity theft.
Suitable to protect 25 x 3 mm flat tape.
Fix using No. 10 x 1½" roundhead or security screws and wall plugs.
Note: Conductor guard supplied unbranded.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Air termination
Introduction

Air termination plays a critical role in the lightning protection system, capturing the fullness of the lightning strike current and channeling this current safely to the conductor network.

It is therefore highly important to install a correctly designed air termination system.

IEC/BS EN 62305-3 advocates the use of air rods or catenary conductors to provide a protective zone above the roof structure and any prominent parts, such as HVAC systems, plus a meshed conductor network to protect flat or slightly inclined roof areas.

Through use of air rods, raised conductor or mesh, a Lightning Protection System designer can achieve appropriate positioning of the air termination in line with the three methods proposed by IEC/BS EN 62305, namely:

- The rolling sphere method
- The protective angle method
- The mesh method

Furse air termination products are specifically designed to provide highly effective protection against the risks and consequences from a direct lightning strike.

Our air rods are manufactured from high conductivity hard drawn copper or aluminium, and provide an excellent, durable strike point for lightning. Supplied with locknut and rolled threads, these air rods fix easily to our air rod bases.

Our comprehensive range of air rod bases, conductor fasteners and clamps are manufactured from high quality copper or aluminium alloys, to ensure that a high level of conductivity is maintained throughout the air termination system, and that these components are robust enough to last a significant number of years on exposed roof lines.

All these components link together with our copper or aluminium conductors, which provide the low resistance path for lightning current, from strike point safely to earth.

Air termination

Air rods

Air rod

Part no.	ABB order code	Rod length (mm)	Rod diameter (mm)	Thread size	Conductor material	Weight each (kg)	Certification/ standards
RA215	7TCA083410R0063	500	Ø15	M16	Copper	0.73	● ●
RA225	7TCA083410R0067	1,000	Ø15	M16	Copper	1.51	● ●
RA230	7TCA083410R0070	1,500	Ø15	M16	Copper	2.35	●
RA240	7TCA083410R0071	2,000	Ø15	M16	Copper	3.00	●
RA250-FU	7TCA083410R0072	3,000	Ø15	M16	Copper	4.70	●
RA015	7TCA083420R0053	500	Ø15	M16	Aluminium	0.29	
RA025	7TCA083420R0054	1,000	Ø15	M16	Aluminium	0.53	
RA030	7TCA083420R0056	1,500	Ø15	M16	Aluminium	0.80	
RA040	7TCA083420R0057	2,000	Ø15	M16	Aluminium	1.06	
RA050	7TCA083420R0058	3,000	Ø15	M16	Aluminium	1.60	
RA400-FU	7TCA083430R0001	500	Ø10	M10	Copper	0.33	●
RA402	7TCA083430R0002	1,000	Ø10	M10	Copper	0.65	●
RA080	7TCA083440R0004	500	Ø10	M10	Aluminium	0.11	
RA085	7TCA083440R0005	1,000	Ø10	M10	Aluminium	0.22	

"Field Trials in the United States, carried out over many years of research have confirmed that blunt air rods are struck by lightning in preference to taper pointed air rods."

Lightning rod improvement studies by C B Moore, W Rison, J Mathis, G Aulich, Journal of Applied Meteorology, May 2000.

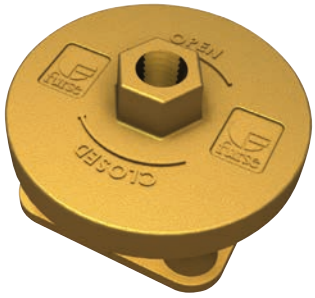
Certification / Standards: ● IEC/BS EN 62561-2 / ● UL 96.
Illustration: air rod base and multiple point not included.
Manufactured from high conductivity hard drawn copper or aluminium. Supplied complete with locknut.
Note: during high winds and extreme weather conditions air rods over 1,000 mm long can be subjected to fatigue mechanisms.
It is therefore recommended that additional supports are considered before installation.

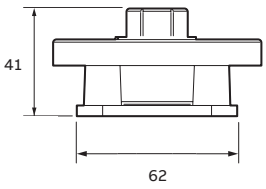
Air termination

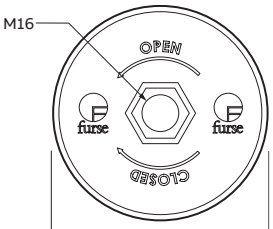
Air rod bases

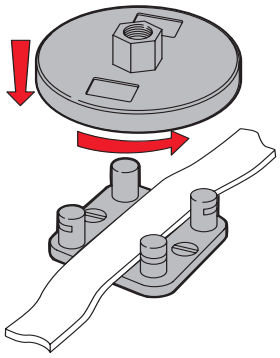
Air rod base

Part no.	ABB order code	Air rod diameter (mm)	Thread size	Maximum Conductor width (mm)	Conductor material	Weight each (kg)	Certification/ standards
SD105-H	7TCA083410R0077	Ø15	M16	25	Copper	0.43	● ●
SD003-H	7TCA083420R0062	Ø15	M16	25	Aluminium	0.14	●
SD120	7TCA083410R0080	Ø15	M16	50	Copper	0.70	









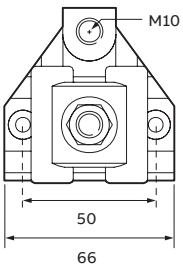
Certification / Standards: ● IEC/BS EN 62561-1 Class H / ● UL 96.
Manufactured from high quality alloys of either copper or aluminium.
Simple to install, providing an effective connection between air rod and air termination tape.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
SD120 not as illustrated (drawing available on request).

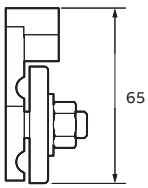
Horizontal or vertical air rod base

Part no.	ABB order code	Air rod diameter (mm)	Thread size	Conductor size (mm)	Conductor material	Mounting plane	Weight each (kg)	Certification/ standards
SD305	7TCA083430R0003	Ø10	M10	Ø8	Copper	Horizontal	0.30	●
SD307	7TCA083430R0004	Ø10	M10	Ø8	Copper	Vertical	0.30	●
SD005	7TCA083440R0006	Ø10	M10	Ø8	Aluminium	Horizontal	0.11	●
SD007	7TCA083440R0007	Ø10	M10	Ø8	Aluminium	Vertical	0.11	●

SD307

SD305





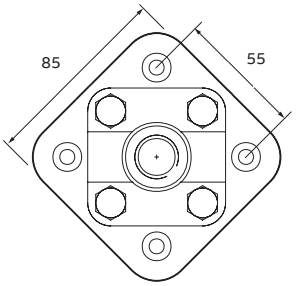
Certification / Standards: ● IEC/BS EN 62561-1 Class H.
Manufactured from high quality alloys of either copper or aluminium.
Simple to install, providing an effective connection between air rod and solid circular air termination conductor, in either the horizontal or vertical plane.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
Tightening torque 15 Nm.

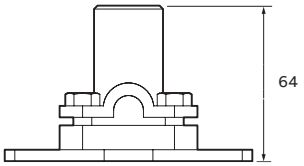
Air termination

Air rod bases & saddles

Flat saddle

Part no.	ABB order code	Air rod diameter (mm)	Thread size	Conductor size (mm^2)	Conductor material	Weight each (kg)	Certification/ standards
SD155	7TCA083450R0034	Ø15	M16	50	Copper	1.00	●
SD160	7TCA083450R0035	Ø15	M16	70	Copper	0.95	●
SD165	7TCA083450R0036	Ø15	M16	95	Copper	0.95	●

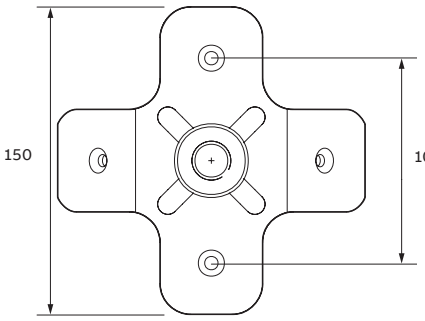


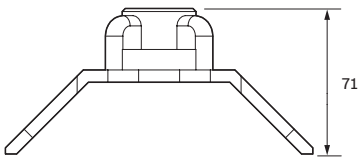


Certification / Standards: ● IEC/BS EN 62561-1 Class H.
Manufactured from high quality copper alloy.
Simple to install, providing an effective connection between air rod and stranded conductor.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005) and wall plugs (Part no. PS305).
Tightening torque 12 Nm.

Ridge saddle

Part no.	ABB order code	Air rod diameter (mm)	Thread size	Max. conductor width (mm)	Conductor material	Weight each (kg)	Certification/ standards
SD015	7TCA083410R0075	Ø15	M16	31	Aluminium	0.45	
SD115	7TCA083410R0079	Ø15	M16	31	Copper	1.07	●





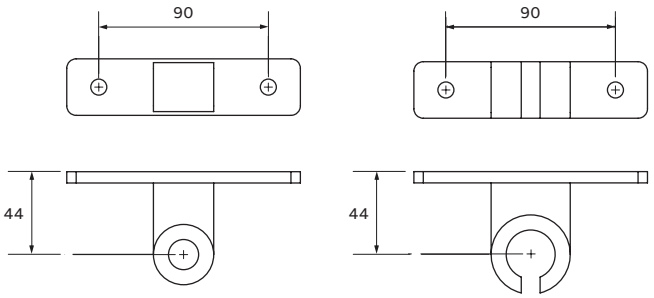
Certification / Standards: ● BS EN 62561-1 Class H.
Manufactured from high quality alloys of either copper or aluminium.
Simple to install, providing an effective fixing for lightning conductor air rods on ridges.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
Tightening torque 15 Nm.

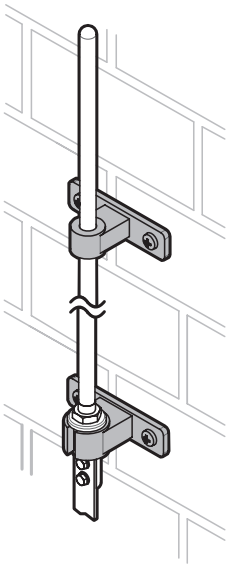
Air termination

Air rod brackets & rod to conductor coupling

Rod brackets

	Part no.	ABB order code	Air rod diameter (mm)	Air rod material	Weight each (kg)
BR105	BR105	7TCA083410R0000	Ø15	Copper	0.90
BR005	BR005	7TCA083420R0034	Ø15	Aluminium	0.28

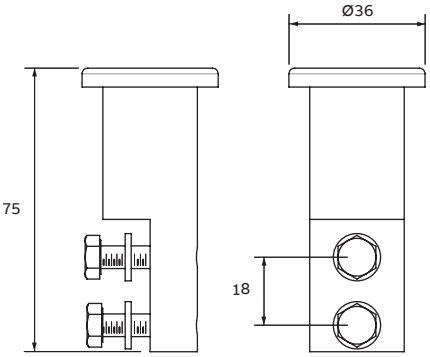


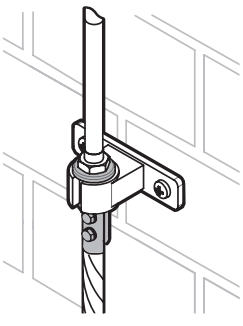


Manufactured from high quality alloys of either copper or aluminium.
Simple to install, providing an effective means of mounting an air rod on to a vertical surface, e.g. chimney stack.
Use in conjunction with a rod to tape or rod to stranded conductor coupling.
Fix using roundhead wood screws 1½" x No. 12 or M8 and wall plugs.

Rod to conductor coupling

	Part no.	ABB order code	Air rod diameter (mm)	Thread size	Conductor size (mm)	Air rod material	Weight each (kg)	Certification/ standards
	For use with flat tape conductor							●
CG600	CG600	7TCA083410R0001	Ø15	M16	25 x 3	Copper	0.23	●
	CG500	7TCA083420R0035	Ø15	M16	25 x 3	Aluminium	0.08	●
	For use with stranded conductor							
CG705	CG705	7TCA083450R0006	Ø15	M16	50-70 mm²	Copper	0.25	●





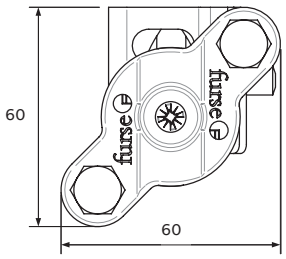
Certification / Standards: ● BS EN 62561-1 Class H.
Manufactured from high quality alloys of either copper or aluminium.
Provides an effective connection between air rod and air termination tape or stranded air termination conductor.
Tightening torque 7 Nm (tape); 6 Nm (stranded).

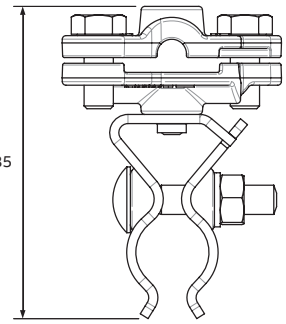
Air termination

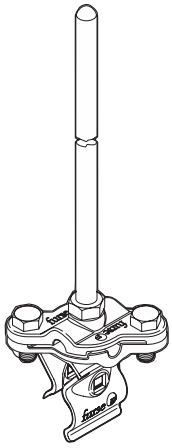
Air rod base for circular standing seam & trapezoidal roofs

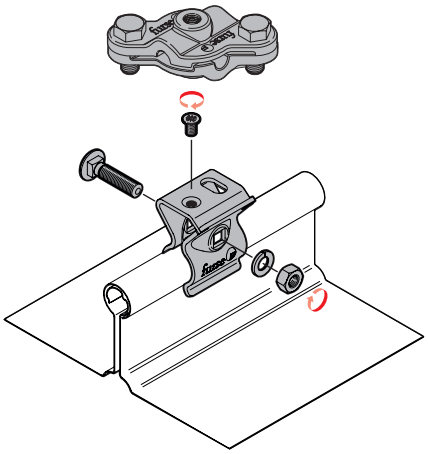
Air rod base circular standing seam roofs

	Part no.	ABB order code	Conductor	Weight each (kg)	Certification / standards
	SC2405	7TCA083870R1867	25 x 3 mm bare copper tape Ø8 mm bare copper solid circular conductor	0.33	●
	SC2407	7TCA083870R1868	25 x 3 mm bare aluminium tape Ø8 mm bare aluminium solid circular conductor	0.21	●



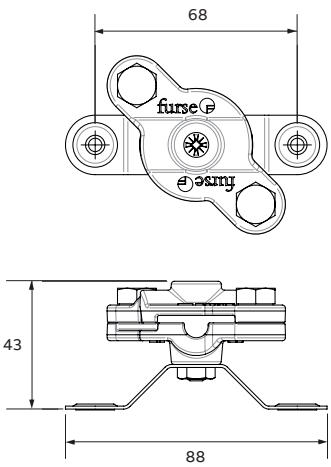


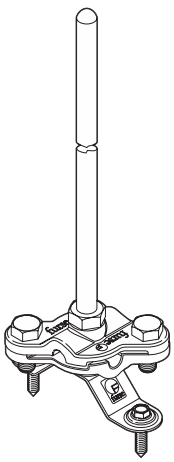


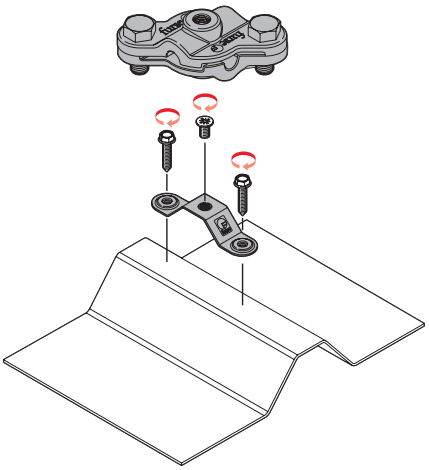


Air rod base for trapezoidal roofs

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification/ standards
	TZ405	7TCA083540R0032	25 x 3 / Ø8	Copper	0.22	●
	TZ407	7TCA083540R0033	25 x 3 / Ø8	Aluminium	0.10	●







Certification / Standards: ● IEC/BS EN 62561-1 Class H (air rod base).
Holdfast manufactured from stainless steel 304.
Designed for excellent corrosion resistance and high pull off loads.
Provides secure clamping of either 25 x 3 mm bare tape or 8 mm diameter solid circular conductor.
Suitable for use on both straight runs and intersections of conductor.
Simple to install to trapezoidal cladding systems using stitching screws provided.
Holdfast torque 2 Nm (aluminium cladding), 2.5 Nm (steel cladding).

Air termination

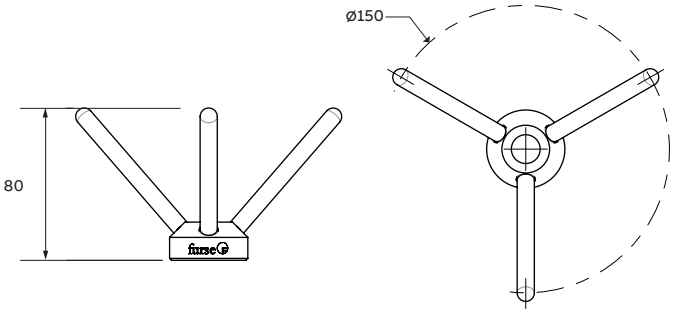
Multiple point & strike pad

Multiple point

	Part no.	ABB order code	Air rod diameter (mm)	Air rod material	Weight each (kg)
RA600	RA600	7TCA083410R0073	Ø15	Copper	0.27
RA500	RA500	7TCA083420R0060	Ø15	Aluminium	0.10

RA600

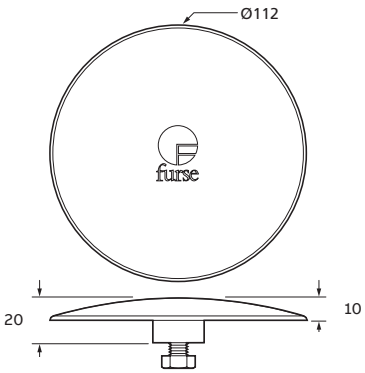
RA500

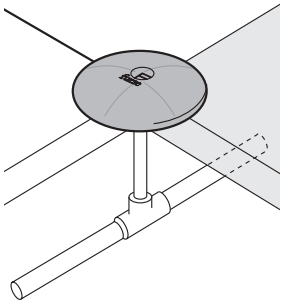


Manufactured from high conductivity hard drawn copper or aluminium.
Suitable for use with 15 mm diameter air rods (see page 32).

Strike pad

	Part no.	ABB order code	Conductor material	Weight each (kg)
	PL010	7TCA083030R0013	Copper	0.30
	PL005-FU	7TCA083030R0012	Aluminium	0.13
	Accessories			
	SM010	7TCA083030R0014	Copper stem for use with PL010	0.07
	SM005	7TCA083130R0105	Stainless steel stem for use with PL005-FU	0.07





Strike pads manufactured from high quality alloys of either copper or aluminium.
Provides an exposed attractive point on conductor systems hidden/embedded in the building's fabric, e.g. below the tiles of a pitched roof.
Supplied with setscrew for attachment of lightning conductors.

Air termination
Free-standing air termination

Furse free-standing interception air rods are designed to protect rooftop mounted or exposed equipment, such as air conditioning units or photovoltaic panels, from a direct lightning strike.

—
01 Interception air rod - 0.5 m to 2 m height.
—
02 Interception air rod - 3 m to 4 m height.
—
03 Interception air rod - 4.5 m to 5.5 m height.
—
04 Interception air rod - 6 m to 8 m height
—
05 Interception air rod - 8 m to 10 m height.

Free-standing interception air rods are easily constructed from a small range of components including air rod or interception pole, support frame and concrete base, to create a complete unit which when connected to the air termination network provides a highly versatile and effective lightning protection solution.

Features & benefits
- Protects rooftop mounted equipment from direct lightning strikes
- Complies with IEC/BS EN 62305 standard
- Lightweight construction
- Corrosion resistant
- Quick and easy to assemble
- Available in a range of heights from 0.5 m to 10 m
- Range of frames and concrete weights for different wind zones
- Large protection zones
- Modular, versatile and robust

Interception air rod (0.5 m to 2 m height)
- Copper or aluminium air rod
- Circular concrete base
- Rod connects directly into base

Interception air rod (3 m to 4 m height)
- 2 piece interception pole with square support frame
- 4 square concrete bases (or 8 doublestacked for higher wind speeds)

Interception air rod (4.5 m to 5.5 m height)
- 2 piece interception pole with tripod support frame
- 3 circular concrete bases

Interception air rod (6 m to 8 m height)
- 3 piece interception pole with tripod support frame
- 6 circular concrete bases

Interception air rod (8 m to 10 m height)
- 3 piece interception pole with ‘H’ shaped support frame
- 10 circular concrete bases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01


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02


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03


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04


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05

All items are sold as separates to form a complete free-standing air rod when combined at installation.

Note: installed interception air rods must have sufficient height to provide a clear zone of protection around the equipment to be protected, as defined by IEC/BS EN 62305-3 (see page 109). Further information can be found in the Furse Guide.

Product selection

Air rod is based on two factors:

- Air rod height required to create the necessary protective zone around the equipment
- Anticipated wind loading at the installation

Wind loading is an important factor, especially for taller interception air rods as extreme weather can subject them to fatigue mechanisms.

For UK installations, the map featured right highlights four key wind zones from which the appropriate free-standing air rod can be established.

Relevant part numbers can then be determined through cross referencing wind loading with the height of air rod required in the table below.

For non-UK installations, please refer to available data for local wind conditions or contact your ABB representative to discuss your requirements.

Key	
Zone 1	Windspeed: < 130 km/h
Zone 2	Windspeed: < 150 km/h
Zone 3	Windspeed: < 170 km/h
Zone 4	Windspeed: < 190 km/h

Rod height (m)	Interception pole Part no.	Frame (where required) and base part no. for windspeeds			
		< 130 km/h	< 150 km/h	< 170 km/h	< 190 km/h
0.5	RA215 or RA015	103101-FU	103101-FU	103101-FU	103101-FU
1	RA225 or RA025	103101-FU	103101-FU	103101-FU	103101-FU
1.5	RA230 or RA030	103110-FU	103110-FU	103110-FU	103110-FU
2	RA240 or RA040	103110-FU	103110-FU	103110-FU	103110-FU
3	912000-FU	499000-FU / 4 x 499100-FU	499000-FU / 4 x 499100-FU	499000-FU / 4 x 499100-FU	499000-FU / 4 x 499100-FU
3.5	912001-FU	499000-FU / 4 x 499100-FU	499000-FU / 4 x 499100-FU	499000-FU / 4 x 499101-FU	499000-FU / 4 x 499101-FU
4	912002-FU	499000-FU / 4 x 499100-FU	499000-FU / 4 x 499101-FU	499000-FU / 8 x 499100-FU	499000-FU / 8 x 499101-FU
4.5	912003-FU	499005-FU / 3 x 103101-FU	499005-FU / 3 x 103110-FU	499005-FU / 3 x 103118-FU	499006-FU / 6 x 103103-FU
5	912004-FU	499005-FU / 3 x 103101-FU	499005-FU / 3 x 103110-FU	499005-FU / 3 x 103118-FU	499006-FU / 6 x 103103-FU
5.5	912005-FU	499005-FU / 3 x 103110-FU	499005-FU / 3 x 103118-FU	499006-FU / 6 x 103103-FU	499006-FU / 6 x 103103-FU
6	912006-FU	499006-FU / 6 x 103103-FU	499006-FU / 6 x 103103-FU	499006-FU / 6 x 103103-FU	499006-FU / 6 x 103101-FU
6.5	912007-FU	499006-FU / 6 x 103103-FU	499006-FU / 6 x 103103-FU	499006-FU / 6 x 103101-FU	499006-FU / 6 x 103118-FU
7	912008-FU	499006-FU / 6 x 103103-FU	499006-FU / 6 x 103101-FU	499006-FU / 6 x 103110-FU	On request
7.5	912009-FU	499006-FU / 6 x 103101-FU	499006-FU / 6 x 103110-FU	499006-FU / 6 x 103118-FU	On request
8	912010-FU	499006-FU / 6 x 103110-FU	499006-FU / 6 x 103118-FU	499007-FU / 10 x 103118-FU	On request
9	912011-FU	499007-FU / 10 x 103118-FU	499007-FU / 10 x 103118-FU	499007-FU / 10 x 103118-FU	On request
10	912013-FU	499007-FU / 10 x 103118-FU	499007-FU / 10 x 103118-FU	On request	On request

Air termination

Free-standing air termination

Free-standing interception pole

Part no.	ABB order code	Pole height (m)	Pole diameter (mm)	Pole construction	Weight each (kg)	Certification/ standards
912000-FU	7TCA083420R0019	3	Ø10-42	2 piece	5.0	●
912001-FU	7TCA083420R0020	3.5	Ø10-42	2 piece	5.5	●
912002-FU	7TCA083420R0021	4	Ø10-42	2 piece	7.0	●
912003-FU	7TCA083420R0022	4.5	Ø10-42	2 piece	9.2	●
912004-FU	7TCA083420R0023	5	Ø10-42	2 piece	10.0	●
912005-FU	7TCA083420R0024	5.5	Ø10-42	2 piece	10.6	●
912006-FU	7TCA083420R0025	6	Ø10-60	3 piece	18.0	●
912007-FU	7TCA083420R0026	6.5	Ø10-60	3 piece	19.0	●
912008-FU	7TCA083420R0027	7	Ø10-60	3 piece	23.5	●
912009-FU	7TCA083420R0028	7.5	Ø10-60	3 piece	26.0	●
912010-FU	7TCA083420R0029	8	Ø10-60	3 piece	28.7	●
912011-FU	7TCA083420R0030	9	Ø10-60	3 piece	30.5	●
912013-FU	7TCA083420R0031	10	Ø10-60	3 piece	35.5	●

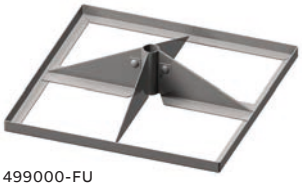
Certification / Standards: ●IEC/BS EN 62561-2.
Interception poles manufactured from stainless steel 304 with aluminium interception tip.
For construction of interception air rods from 3 to 10 m in height comprising interception pole, support frame and concrete bases.
Multi-component, stackable system with screw retention. Supplied with 3 securing brackets for base frame connection.

Air termination

Free-standing air termination

Free-standing interception pole base frame

	Part no.	ABB order code	Frame type	Frame dimension (mm)	Weight each (kg)
	499000-FU	7TCA083420R0013	Square base	650 x 650	7
	499005-FU	7TCA083420R0014	Tripod base	1350 x 1350	8
	499006-FU	7TCA083420R0015	Tripod base	1850 x 1850	24.5
	499007-FU	7TCA083420R0016	H shaped base	1850 x 1850	39.5



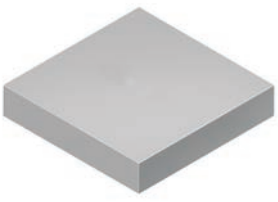
499000-FU

499005-FU
Interception pole position shown for illustration purposes. Pole not included.

Manufactured from 304 grade stainless steel.
Dimensions are approximate and include concrete base dimensions.

Free-standing interception pole base

	Part no.	ABB order code	Description	Weight each (kg)
103103-FU	499100-FU	7TCA083420R0017	Square concrete base 300 x 300 x 60 mm	12
	499101-FU	7TCA083420R0018	Square concrete base 300 x 300 x 80 mm	16
	103103-FU	7TCA083420R0003	Circular concrete base with M16 insert	12
	103101-FU	7TCA083420R0001	Circular concrete base with M16 insert	16
	103110-FU	7TCA083450R0000	Circular concrete base with M16 insert	20
	103118-FU	7TCA083420R0004	Circular concrete base with M16 insert	25
	Accessories			
	103098-FU	7TCA083420R0002	Protective PE-EVA tray for circular concrete blocks	0.14
499100-FU	919828-FU	7TCA083550R0000	Stainless steel clamp for connecting 25 x 3 mm copper tape to 5-19 mm thickness steel	0.55



Conductor network

Metallic conductor clips

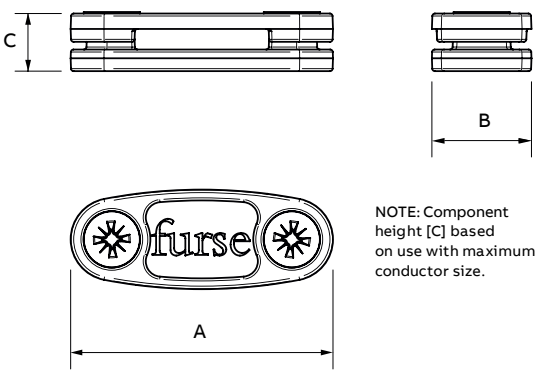
Tape clip

CP210

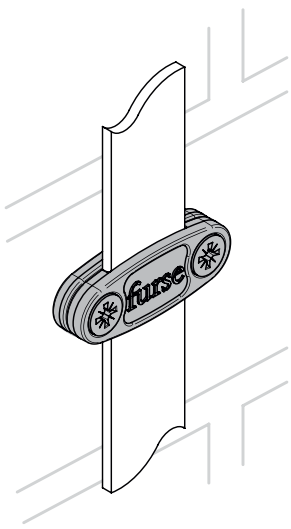
CP215

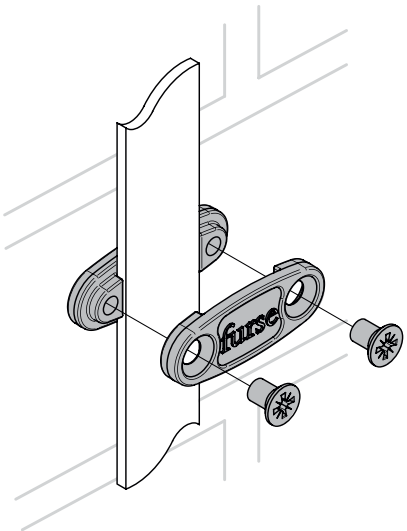
CP110

Part no.	ABB order code	Conductor width (mm)	Conductor thickness (mm)	Dimensions (mm) A	B	C	Weight each (kg)	Certification/ standards
For use with bare copper								
CP205	7TCA083510R0004	20	3	45	19	12	0.06	● ●
CP210	7TCA083510R0005	25	3-4	51	19	11	0.05	● ●
CP220	7TCA083510R0012	25	5-6	51	19	14	0.06	● ●
CP230	7TCA083510R0016	30-32	3-4	60	19	12	0.06	●
CP235	7TCA083510R0018	30-32	5-6.5	60	19	15	0.06	●
CP240	7TCA083510R0020	38-40	3-4	68	21	12	0.07	●
CP245	7TCA083510R0025	38-40	5-6.5	68	21	15	0.07	●
CP255	7TCA083510R0030	50	3-4	78	21	12	0.07	●
CP260	7TCA083510R0033	50	5-6.5	78	21	15	0.08	● ● ●
For use with PVC covered copper								
CP215	7TCA083510R0010	25	3-4	56	20	14	0.06	● ●
CP225	7TCA083510R0014	25	6	59	20	19	0.13	●
CP265	7TCA083510R0037	50	6	90	30	19	0.26	●
For use with lead covered copper								
CP305	7TCA083510R0039	25	3	59	20	16	0.20	●
For use with bare aluminium								
CP105	7TCA083520R0000	20	3	45	19	12	0.02	●
CP110	7TCA083520R0001	25	3-4	51	19	11	0.02	● ●
CP125	7TCA083520R0007	50	6	79	25	14	0.05	●
For use with PVC covered aluminium								
CP115	7TCA083520R0005	25	3	59	20	14	0.04	●
CP130	7TCA083520R0014	50	6	90	30	19	0.06	●



NOTE: Component height [C] based on use with maximum conductor size.





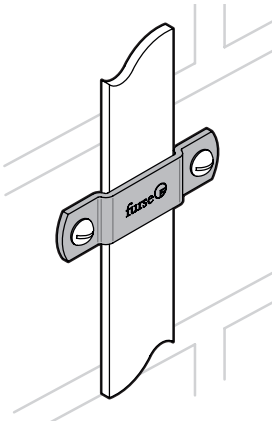
Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-4 / ● UL 96.
High quality alloys of either copper or aluminium down conductor clip for securing flat tape. Other sizes available to order.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).

Conductor network

Metallic conductor clips

Pressed tape clip

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Certification/ standards
For use with bare copper				
CP510	7TCA083510R0041	20 x 3	0.02	●
CP515	7TCA083510R0042	25 x 3	0.02	●
For use with bare aluminium				
CP405	7TCA083520R0008	20 x 3	0.01	●
CP410	7TCA083520R0009	25 x 3	0.01	●
CP415	7TCA083520R0010	25 x 6	0.01	●
For use with PVC covered tape				
CP517	7TCA083510R0043	25 x 3	0.02	



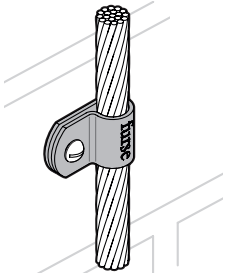
Certification / Standards: ● BS EN 13601 (copper) / ● BS EN 755-5 (aluminium).
Manufactured from pure copper or aluminium, these pressed clips are available in a range of sizes to suit bare and PVC covered copper and aluminium tapes.
Fix using roundhead wood screws 1½" No. 10 or M6 (Part no. SW305 or SW405) and wall plugs (Part no. PS305).

Conductor network

Metallic conductor clips

One hole cable clip

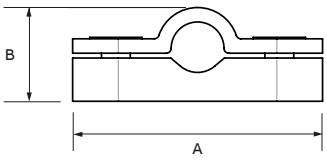
Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification/ standards
For use with solid circular conductor					
CP905	7TCA083560R0003	Ø8	Copper	0.01	●
CP925	7TCA083560R0007	Ø8	Aluminium	0.01	● ●
CP915	7TCA083560R0005	Ø10*	Copper	0.01	●
CP935	7TCA083560R0008	Ø10*	Aluminium	0.01	● ●
For use with stranded conductor					
CP910	7TCA083830R0007	50 mm²	Copper	0.01	●
CP915	7TCA083560R0005	70 mm²	Copper	0.01	●
CP920	7TCA083830R0008	95 mm²	Copper	0.01	●

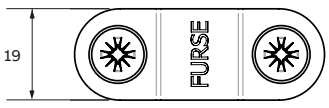


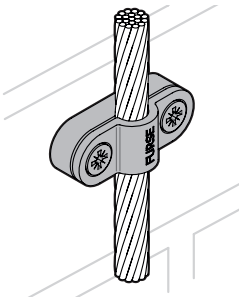
Certification / Standards: ● BS EN 13601 / ● BS EN 755-5.
Manufactured from pure copper or aluminium, these pressed clips are available to suit bare and PVC covered copper and aluminium solid circular conductor, and bare copper stranded conductor.
Fix using roundhead wood screws 1½" No. 10 or M6 (Part no. SW305 or SW405) and wall plugs (Part no. PS305).
*PVC covered Ø8 mm conductor.
Clip supplied in open position.

Heavy duty cast cable saddle

Part no.	ABB order code	Conductor size (mm)	Dimensions (mm) A	Dimensions (mm) B	Conductor material	Weight each (kg)	Certification/ standards
For use with solid circular conductor							
CP805	7TCA083560R0000	Ø8	52	20	Copper	0.09	
CP806	7TCA083560R0001	Ø8	52	20	Aluminium	0.03	
CP815	7TCA083830R0004	Ø10*	52	20	Copper	0.10	●
CP816	7TCA083560R0002	Ø10*	52	20	Aluminium	0.04	
For use with stranded conductor							
CP810	7TCA083830R0002	50 mm²	52	20	Copper	0.10	
CP815	7TCA083830R0004	70 mm²	52	20	Copper	0.10	●
CP835	7TCA083830R0006	95 mm²	52	21	Copper	0.10	
CP840	7TCA083830R0110	120 mm²	52	23	Copper	0.10	







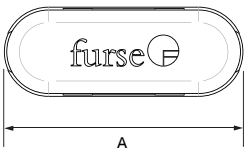
Certification / Standards: ● IEC/BS EN 62561-4.
Manufactured from high quality alloys of either copper or aluminium for excellent corrosion resistance and high pull off loads.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
*For use with PVC covered Ø8 mm conductor or for supporting air terminals when used in conjunction with wall mounted air rod bases.
Can also be used with glazing bar holdfast and back plate holdfast stem.

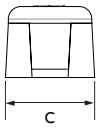
Conductor network

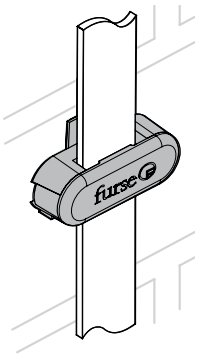
Non-metallic conductor clips

Non-metallic tape clip

Part no.	ABB order code	Conductor size (mm)	Dimensions (mm) A	B	C	Weight each (kg)	Colour	Certification/ standards
For use with bare tape								
CP005	7TCA083550R0005	20 x 3	46	17	20	0.01	Brown	
CP010	7TCA083550R0006	20 x 3	46	17	20	0.01	Grey	
CP015	7TCA083550R0007	25 x 3	52	17	20	0.01	Brown	●
CP020	7TCA083550R0014	25 x 3	52	17	20	0.01	Grey	●
CP065*	7TCA083550R0088	50 x 6	69	19	24	0.02	Brown	
For use with PVC covered tape								
CP025	7TCA083550R0027	25 x 3	56	20	20	0.01	Brown	●
CP030	7TCA083550R0037	25 x 3	56	20	20	0.01	Black	●
CP033	7TCA083550R0129	25 x 3	56	20	20	0.01	Dark grey	●
CP035	7TCA083550R0048	25 x 3	56	20	20	0.01	Green	●
CP040	7TCA083550R0052	25 x 3	56	20	20	0.01	Grey	●
CP045	7TCA083550R0069	25 x 3	56	20	20	0.01	Stone	●
CP050	7TCA083550R0079	25 x 3	56	20	20	0.01	White	●



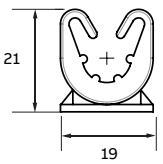


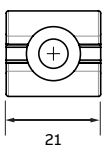


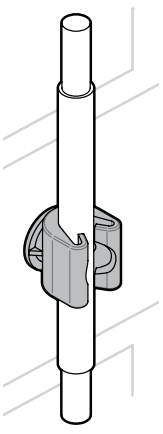
Certification / Standards: ● IEC/BS 62561-4
High grade Polypropylene, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Available in six colours to match bare and PVC covered copper and aluminium tapes.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305). *Unbranded/not as illustrated (drawing available on request).

Non-metallic push-in clip

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour
For use with bare solid circular conductor				
CP887	7TCA083570R0006	Ø8	0.01	Brown
CP872	7TCA083570R0002	Ø8	0.01	Grey
For use with PVC covered solid circular conductor				
CP886	7TCA083570R0005	Ø10*	0.01	Brown
CP861	7TCA083570R0000	Ø10*	0.01	Black
CP871	7TCA083570R0001	Ø10*	0.01	Grey
CP876	7TCA083570R0003	Ø10*	0.01	Stone
CP881	7TCA083570R0004	Ø10*	0.01	White







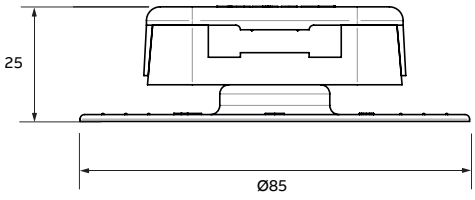
High grade Polypropylene, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Available in five colours to match bare and PVC covered copper and aluminium solid circular conductors.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
*PVC covered Ø8 mm conductor. Note: push-in clips are supplied unbranded.

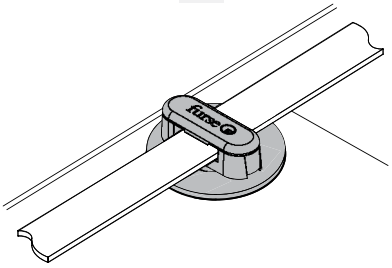
Conductor network

Glue down non-metallic conductor clips

Glue down tape clip

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour	Certification/ standards
For use with bare tape					
GD015	7TCA083580R0067	25 x 3	0.03	Brown	●
GD020	7TCA083580R0068	25 x 3	0.03	Grey	●
For use with PVC covered tape					
GD025	7TCA083580R0069	25 x 3	0.03	Brown	●
GD030	7TCA083580R0070	25 x 3	0.03	Black	●
GD040	7TCA083580R0071	25 x 3	0.03	Grey	●
GD045	7TCA083580R0072	25 x 3	0.03	Stone	●
GD050	7TCA083580R0073	25 x 3	0.03	White	

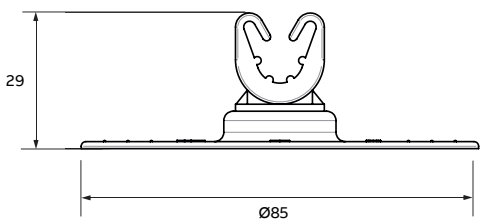


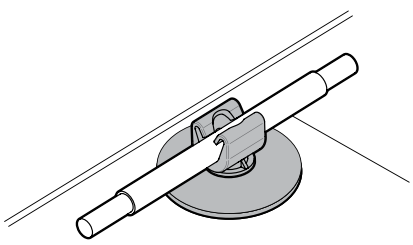


Certification / Standards: ● IEC/BS EN 62561-4.
Use on clay roof tiles. Supplied in a box of 50 complete with adhesive. Additional glue gun is required.
Dressing tool accessory (DT100) enables flat tape to be set at roof level.
Disc Ø85 mm.

Glue down push-in clip

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour
For use with bare solid circular conductor				
GD887	7TCA083580R0077	Ø8	0.03	Brown
GD872	7TCA083580R0075	Ø8	0.03	Grey
For use with PVC covered solid circular conductor				
GD886	7TCA083580R0125	Ø10*	0.03	Brown
GD861	7TCA083580R0126	Ø10*	0.03	Black
GD871	7TCA083580R0074	Ø10*	0.03	Grey
GD876	7TCA083580R0127	Ø10*	0.03	Stone
GD881	7TCA083580R0076	Ø10*	0.03	White





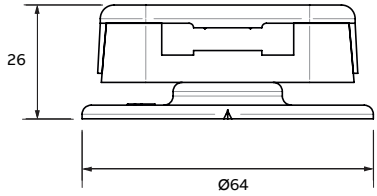
Use on clay roof tiles. Supplied in a box of 50 complete with adhesive. Additional glue gun is required.
*PVC covered Ø8 mm conductor.
Disc Ø85 mm.

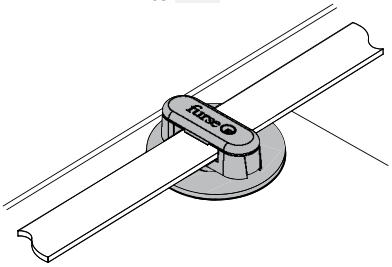
Conductor network

Self adhesive non-metallic conductor clips

Self adhesive tape clip

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour	Certification/ standards
For use with bare tape					
CA015-FU	7TCA083580R0001	25 x 3	0.03	Brown	●
CA020-FU	7TCA083580R0102	25 x 3	0.03	Grey	●
For use with PVC covered tape					
CA025-FU	7TCA083580R0008	25 x 3	0.03	Brown	●
CA030-FU	7TCA083580R0128	25 x 3	0.03	Black	●
CA040-FU	7TCA083580R0118	25 x 3	0.03	Grey	●
CA045-FU	7TCA083580R0129	25 x 3	0.03	Stone	●
CA050-FU	7TCA083580R0109	25 x 3	0.03	White	

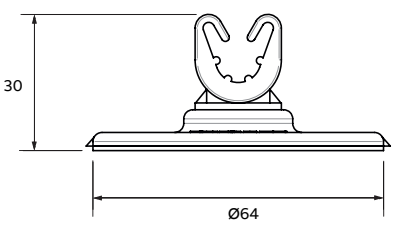


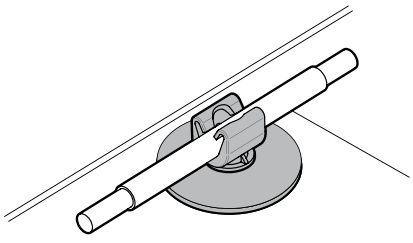


Certification / Standards: ● IEC/BS EN 62561-4.
Designed to secure conductors to surfaces that cannot be penetrated by a screw. Ideal for aluminium, spangled galvanized steel, colour coated steel, glass, perspex, enamel and stainless steel etc. Manufactured from high grade synthetic polymers, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Use on surfaces other than PVC roofing.
Dressing tool accessory (DT100) enables flat tape to be set at roof level.
Disc Ø64 mm.

Self adhesive push-in clip

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour
For use with bare solid circular conductor				
CA887	7TCA083590R0006	Ø8	0.02	Brown
CA872	7TCA083590R0002	Ø8	0.02	Grey
For use with PVC covered solid circular conductor				
CA886	7TCA083590R0005	Ø10*	0.02	Brown
CA861	7TCA083590R0000	Ø10*	0.02	Black
CA871	7TCA083590R0001	Ø10*	0.02	Grey
CA876	7TCA083590R0003	Ø10*	0.02	Stone
CA881	7TCA083590R0004	Ø10*	0.02	White





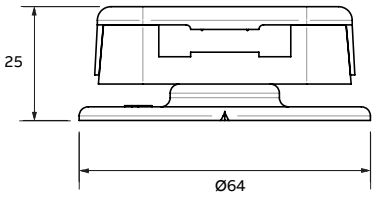
Designed as a means of securing conductors to surfaces that cannot be penetrated by a screw. Ideal for aluminium, spangled galvanized steel, colour coated steel, glass, perspex, enamel and stainless steel etc. Manufactured from high grade synthetic polymers, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Use on surfaces other than PVC roofing.
*PVC covered Ø8 mm conductor.
Disc Ø64 mm.

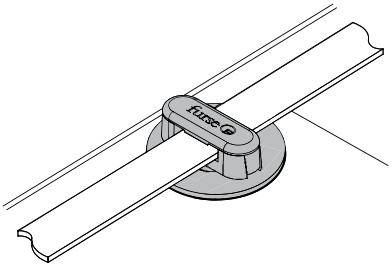
Conductor network

Solvent weldable non-metallic conductor clips

Solvent weldable tape clip

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour	Certification/ standards
For use with bare tape					
CW015-FU	7TCA083580R0022	25 x 3	0.03	Brown	●
CW020-FU	7TCA083580R0025	25 x 3	0.03	Grey	●
For use with PVC covered tape					
CW025-FU	7TCA083580R0130	25 x 3	0.03	Brown	●
CW030-FU	7TCA083580R0131	25 x 3	0.03	Black	●
CW040-FU	7TCA083580R0132	25 x 3	0.03	Grey	●
CW045-FU	7TCA083580R0133	25 x 3	0.03	Stone	●
CW050-FU	7TCA083580R0110	25 x 3	0.03	White	

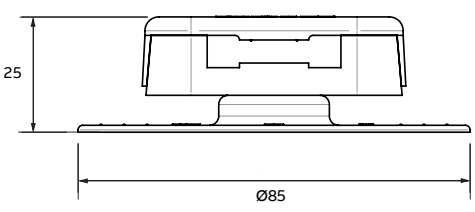


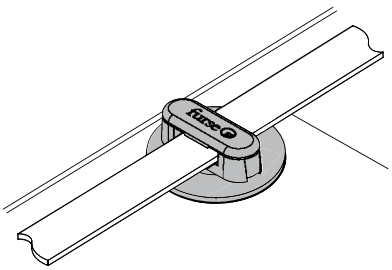


Certification / Standards: ● IEC/BS EN 62561-4.
Provides a secure means of fixing conductors to single ply PVC roof membranes.
Manufactured from high grade synthetic polymers, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Use with welding solvent CW905. Dressing tool accessory (DT100) enables flat tape to be set at roof level.
Solvent weldable clips for solid circular conductor available to order.
Disc Ø64 mm.

Heat weldable clips for PVC roofing

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour	Certification/ standards
For use with bare tape					
HW015-FU	7TCA083580R0106	25 x 3	0.03	Brown	●
HW020-FU	7TCA083580R0104	25 x 3	0.03	Grey	●
For use with PVC covered tape					
HW025-FU	7TCA083580R0121	25 x 3	0.03	Brown	●
HW030-FU	7TCA083580R0134	25 x 3	0.03	Black	●
HW040-FU	7TCA083580R0114	25 x 3	0.03	Grey	●
HW045-FU	7TCA083580R0135	25 x 3	0.03	Stone	●
HW050-FU	7TCA083580R0136	25 x 3	0.03	White	





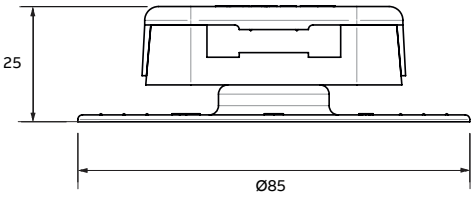
Certification / Standards: ● IEC/BS EN 62561-4.
Provides a secure means of fixing flat tape conductors to single ply, PVC roof membranes using an industrial heat gun, where solvent welding is not applicable.
Manufactured from high grade synthetic polymers, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Dressing tool accessory (DT100) enables flat tape to be set at roof level.
Heat weldable clips for solid circular conductor available to order.
PVC disc Ø85 mm.

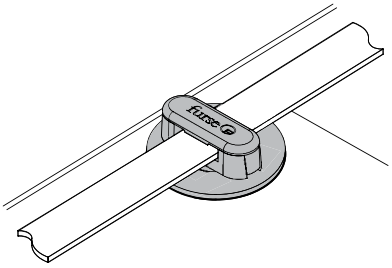
Conductor network

Heat weldable non-metallic conductor clips

Heat weldable clips for TPO/FPO roofing

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour	Certification/ standards
For use with bare tape					
HW315	7TCA083580R0138	25 x 3	0.03	Brown	●
HW320	7TCA083580R0107	25 x 3	0.03	Grey	●
For use with PVC covered tape					
HW325	7TCA083580R0139	25 x 3	0.03	Brown	●
HW330	7TCA083580R0140	25 x 3	0.03	Black	●
HW340	7TCA083580R0101	25 x 3	0.03	Grey	●
HW345	7TCA083580R0141	25 x 3	0.03	Stone	●
HW350	7TCA083580R0119	25 x 3	0.03	White	

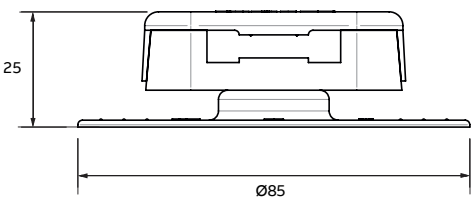


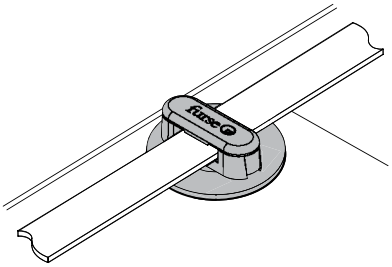


Certification / Standards: ● IEC/BS EN 62561-4.
Provides a secure means of fixing flat tape conductors to single ply polypropylene roof membranes using an industrial heat gun, where solvent welding is not applicable.
Manufactured from high grade PVC, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Dressing tool accessory (DT100) enables flat tape to be set at roof level.
Heat weldable clips for solid circular conductor available to order.
Disc Ø85 mm.

Heat weldable clips for polyethylene roofing

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Colour	Certification/ standards
For use with bare tape					
HW415	7TCA083550R0126	25 x 3	0.03	Brown	●
HW420	7TCA083580R0142	25 x 3	0.03	Grey	●
For use with PVC covered tape					
HW425	7TCA083580R0143	25 x 3	0.03	Brown	●
HW430	7TCA083580R0144	25 x 3	0.03	Black	●
HW440	7TCA083580R0145	25 x 3	0.03	Grey	●
HW445	7TCA083580R0146	25 x 3	0.03	Stone	●
HW450	7TCA083580R0137	25 x 3	0.03	White	





Certification / Standards: ● IEC/BS EN 62561-4.
Provides a secure means of fixing flat tape conductors to single ply, polyethylene roof membranes using an industrial heat gun, where solvent welding is not applicable.
Manufactured from high grade synthetic polymers, UV stabilized against degradation by sunlight and non-brittle to prevent cold weather damage.
Dressing tool accessory (DT100) enables flat tape to be set at roof level.
Heat weldable clips for solid circular conductor available to order.
Disc Ø85 mm.

Conductor network

Non-metallic clip accessories & felt roof clip

Non-metallic clip accessories

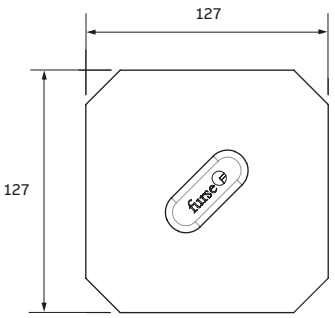
Part no.	ABB order code	Description	Weight each (kg)
CW905	7TCA083830R0009	Universal welding solvent - 500 ml spray applicator (sufficient for application of approx 200 clips) Use with Furse solvent weldable clips only	0.57
CW999	7TCA083830R0010	Cleaning solution (Acetone) - 500 ml spray applicator For cleaning lacquered roofing membranes	0.62
CA900	7TCA083830R0001	Surface primer - 250 ml spray applicator (sufficient for application of approx 500 clips) Use with Furse adhesive clips only	0.24
DT100	7TCA083320R0003	Dressing tool - For use with adhesive and weldable tape clips	0.31

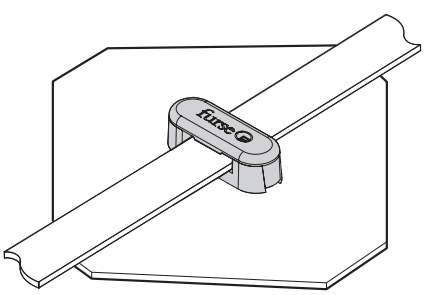
Solvent, cleaning solution and surface primer cannot be supplied outside the UK. For overseas projects, please contact us for advice.
CoSHH Datasheets available on request.

Bitumen felt roof clip

Shade of coloured felt may vary

Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Clip Colour	Felt Colour	Certification / standards
For use with bare tape						
FP015	7TCA083580R0061	25 x 3	0.09	Brown	Green	●
FP020	7TCA083580R0062	25 x 3	0.09	Grey	Green	●
For use with PVC covered tape						
FP025	7TCA083580R0063	25 x 3	0.09	Brown	Green	●
FP030	7TCA083580R0064	25 x 3	0.09	Black	Green	
FP040	7TCA083580R0065	25 x 3	0.09	Grey	Green	●
FP045	7TCA083580R0108	25 x 3	0.09	Stone	Green	
FP050	7TCA083580R0066	25 x 3	0.09	White	Green	





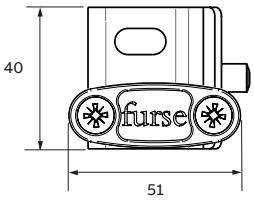
Certification / Standards: ● IEC/BS EN 62561-4.
Use on bitumen felt roofing only.

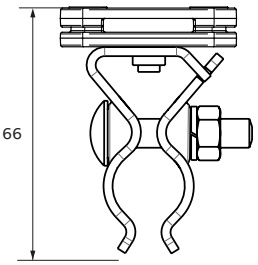
Conductor network

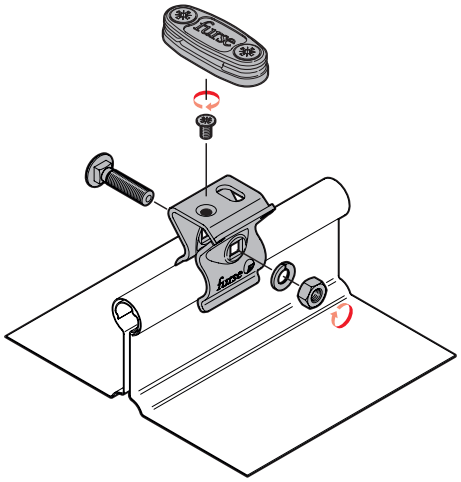
Circular standing seam holdfasts

Conductor fasteners for tape

	Part no.	ABB Order code	Conductor size (mm)	Clip colour	Conductor material	Weight each (kg)	Certification / standards
	SC2210	7TCA083870R1866	25 x 3	–	Copper	0.18	●
	SC2110	7TCA083870R1865	25 x 3	–	Aluminium	0.15	●



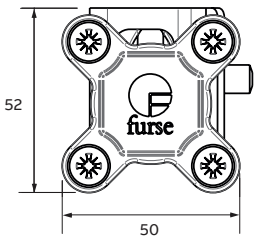


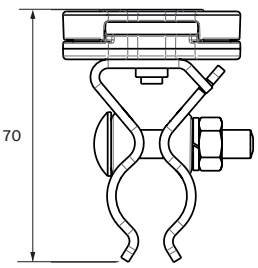


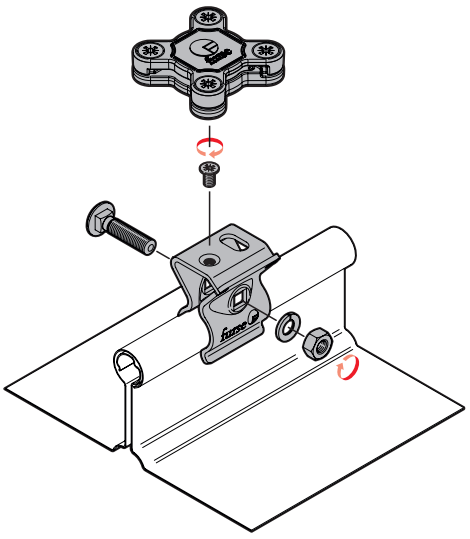
Certification / Standards: ● IEC/BS EN 62561-4 (clip).
Conductor clip manufactured from high quality alloys of either copper or aluminium. Holdfast manufactured from stainless steel 304. Metallic clips designed for excellent corrosion resistance and high pull off loads. For air-termination, the use of metallic clips with bare conductor is recommended for effective current sharing across the roof.

Junction clamps for tape

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	SC2105	7TCA083870R1864	25 x 3	Copper	0.18	●
	SC2005	7TCA083870R1863	25 x 3	Aluminium	0.12	●







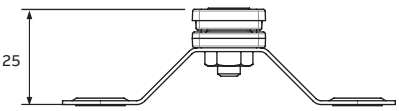
Certification / Standards: ● IEC/BS EN 62561-1 Class H (clamp).
Square tape clamp manufactured from high quality alloys of either copper or aluminium. Holdfast manufactured from stainless steel 304.
Designed for excellent corrosion resistance and high pull off loads.

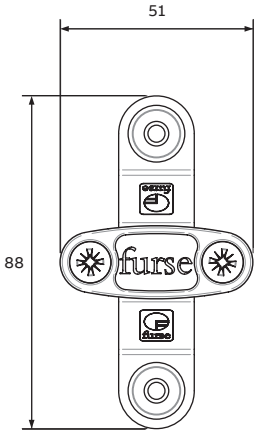
Conductor network

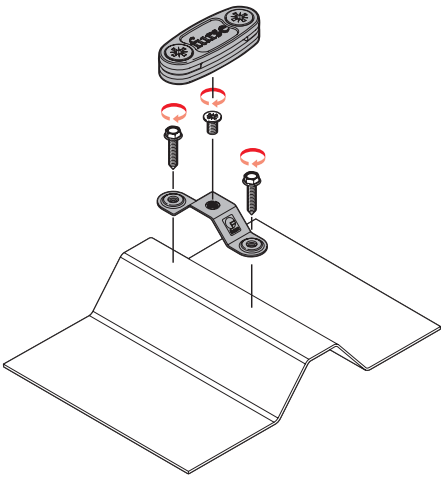
Trapezoidal cladding holdfasts

Conductor fasteners for tape

Part no.	ABB order code	Conductor	Weight each (kg)	Certification / standards
TZ210	7TCA083540R0027	25 x 3 mm bare copper tape	0.09	●
TZ110	7TCA083540R0026	25 x 3 mm bare aluminium tape	0.05	●
TZ040*	7TCA083550R0123	25 x 3 mm grey PVC covered tape	0.03	●



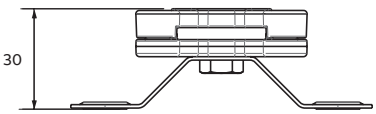


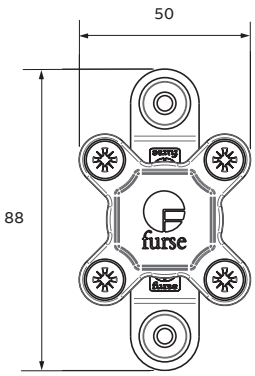


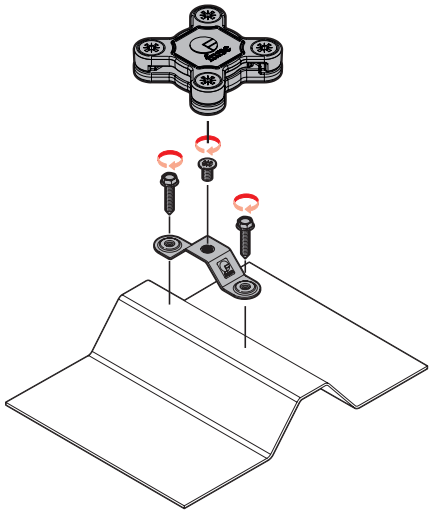
Certification / Standards: ● IEC/BS EN 62561-4 (clip).
Conductor clip manufactured from high quality copper alloy (TZ210) or aluminium alloy (TZ110), or grey high grade polypropylene (TZ040).
Holdfast manufactured from stainless steel 304. Metallic clips designed for excellent corrosion resistance and high pull off loads. Simple to install to trapezoidal cladding systems using stitching screws provided. For air-termination, the use of metallic clips with bare conductor is recommended for effective current sharing across the roof.
Holdfast torque 2 Nm (aluminium cladding), 2.5 Nm (steel cladding). Clips for use with other colour PVC covered down-conductors are available on request. Boxed in 25's.
*Non-metallic fasteners and fasteners for PVC covered conductor may be used as part of a down-conductor system.

Junction clamps for tape

Part no.	ABB Order code	Conductor	Weight each (kg)	Certification / standards
TZ105	7TCA083540R0023	25 x 3 mm bare copper tape	0.14	●
TZ005	7TCA083540R0031	25 x 3 mm bare aluminium tape	0.08	●





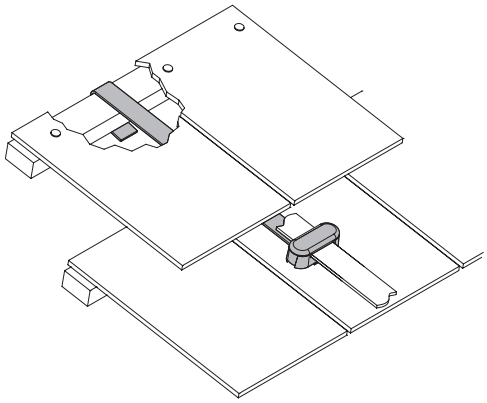


Certification / Standards: ● IEC/BS EN 62561-1 Class H (clamp).
Square tape clamp manufactured from high quality alloys of either copper or aluminium. Holdfast manufactured from stainless steel 304.
Designed for excellent corrosion resistance and high pull off loads. Simple to install to trapezoidal cladding systems using stitching screws provided.
Holdfast torque 2 Nm (aluminium cladding), 2.5 Nm (steel cladding). Boxed in 10's.

Conductor network
Slate holdfasts

Slate holdfast with non-metallic tape clip

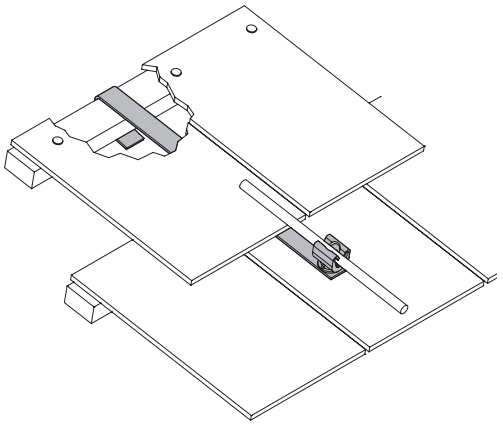
Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Clip colour	Certification / standards
For use with bare tape					
HF015	7TCA083540R0000	25 x 3	0.06	Brown	●
HF020	7TCA083540R0003	25 x 3	0.06	Grey	●
For use with PVC covered tape					
HF025	7TCA083540R0005	25 x 3	0.06	Brown	●
HF030	7TCA083540R0008	25 x 3	0.06	Black	●
HF033	7TCA083540R0038	25 x 3	0.06	Dark grey	●
HF040	7TCA083540R0010	25 x 3	0.06	Grey	●
HF045	7TCA083540R0012	25 x 3	0.06	Stone	●



Certification / Standards: ● IEC/BS EN 62561-4 (clip).
Designed to allow tape conductors to be fixed to tiled roofs without compromising the waterproofing nature of the roof.
The 500 mm tail fits neatly between overlapping tiles and is wrapped around/fixed to the tile lathe for secure fitting.

Slate holdfast with non-metallic push-in clip

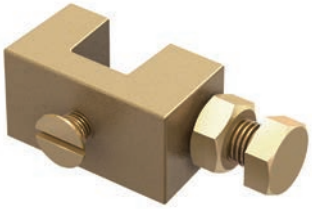
Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Clip colour
HF176	7TCA083560R0021	Ø8	0.03	Brown
HF191	7TCA083560R0022	Ø8	0.03	Grey

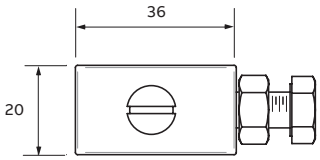


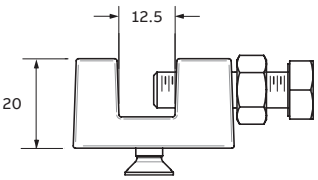
Designed to allow solid circular conductors to be fixed to tiled roofs without compromising the waterproofing nature of the roof. The 500 mm tail fits neatly between overlapping tiles and is wrapped around/fixed to the tile lathe for secure fitting.
Note: slate holdfasts with push-in clip are supplied unbranded.

Conductor network
Holdfasts

Glazing bar holdfast

	Part no.	ABB order code	Conductor material	Maximum glazing bar width (mm)	Weight each (kg)
	HF705	7TCA083540R0017	Copper	12	0.11
	HF710	7TCA083540R0018	Aluminium	12	0.05





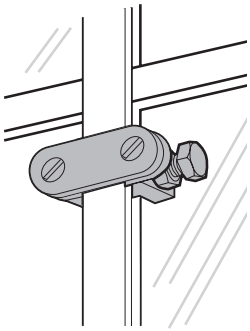
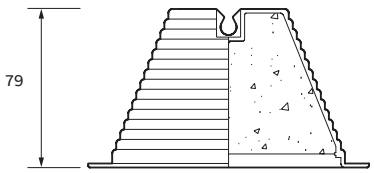


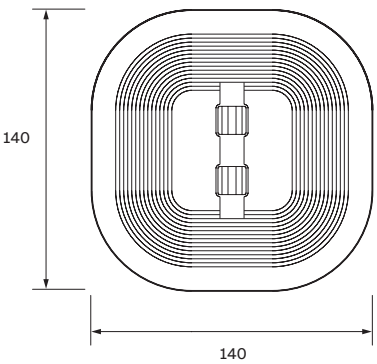
Illustration: conductor clip sold separately.

Manufactured from high quality alloys of either copper or aluminium. Simple to install, providing secure anchorage to thin metallic sections that cannot be drilled. e.g. window mullions, angle iron etc. Once fixed any metallic or non-metallic conductor clip can be attached with the screw provided.

Pyramid holdfast

	Part no.	ABB order code	Conductor size (mm)	Weight each (kg)
	HF975	7TCA083570R0011	Ø8 mm solid circular	0.97





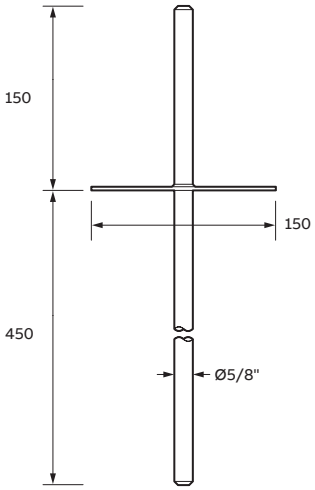
Designed to secure bare, 8 mm diameter, solid circular conductors to flat roofs.
Supplied filled with concrete the conductor is held in place by the weight of the holdfast.
The lip around the base of the product permits the holdfast to be built into bitumen type roofs.
Note: pyramid holdfast is supplied unbranded.

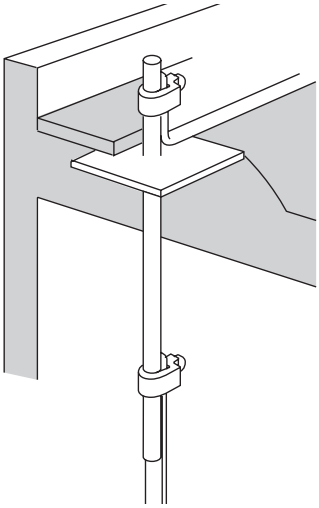
Conductor network

Holdfast & puddle flange

Puddle flange

Part no.	ABB order code	Conductor material	Weight each (kg)
PF105	7TCA083870R1104	Copper	1.54
PF005	7TCA083870R1103	Aluminium	0.50





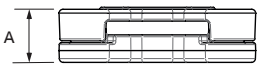
Permits lightning conductors to pass through flat roofs without damaging the waterproof nature of the roof.

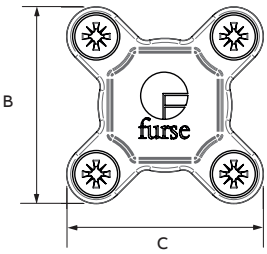
Conductor network

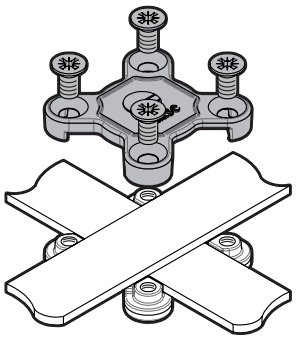
Conductor clamps

Square tape clamp

	Part no.	ABB order code	Dimensions (mm) A	B	C	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
CT105-H	CT105-H	7TCA083610R0010	12.5	50	50	25 x 3	Copper	0.12	● ●
	CT110-H	7TCA083610R0015	23	62	62	25 x 6	Copper	0.30	●
	CT115-H	7TCA083610R0018	29	82	82	50 x 6	Copper	0.60	●
CT005-H	CT005-H	7TCA083620R0003	12.5	50	50	25 x 3	Aluminium	0.06	●
	CT010*	7TCA083610R0007	20	60	60	25 x 6	Aluminium	0.16	



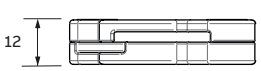


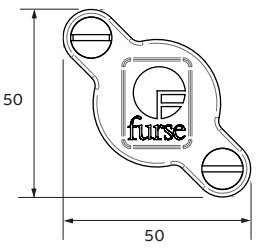


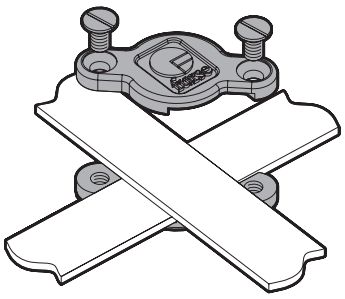
Certification / Standards: ● IEC/BS EN 62561-1 Class H / ● UL 96.
Manufactured from high quality alloys of either copper or aluminium. Simple to install, providing an effective low resistance connection between overlapping tapes to allow cross, tee, through and right angle joints to be formed.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
Tightening torque 5 Nm.
* Not as illustrated (drawing available on request).

Crossover tape clamp

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CX105-H	7TCA083610R0025	25 x 3	Copper	0.09	●
	CX005-H	7TCA083610R0024	25 x 3	Aluminium	0.03	●





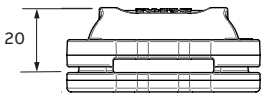


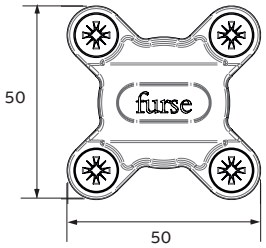
Certification / Standards: ● BS EN 62561-1 Class H.
Manufactured from high quality alloys of either copper or aluminium. Simple to install, providing an effective low resistance connection between overlapping tapes to allow cross joints to be formed.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
Tightening torque 5 Nm.

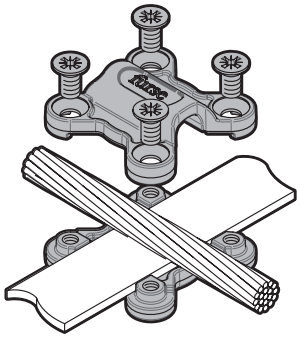
Conductor network
Conductor clamps

Cable to tape square clamp

	Part no.	ABB order code	Conductor size	Conductor material	Weight each (kg)	Certification / standards
	CT125-FU	7TCA083620R0064	25 x 3 mm to 50 mm²	Copper	0.12	●
	CT130-FU	7TCA083620R0065	25 x 3 mm to 70 mm²	Copper	0.12	●
	CT135-FU	7TCA083620R0066	25 x 3 mm to 95 mm²	Copper	0.13	●



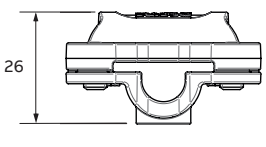


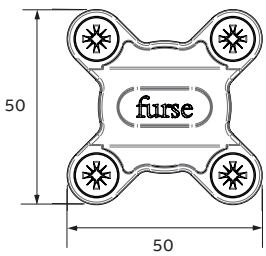


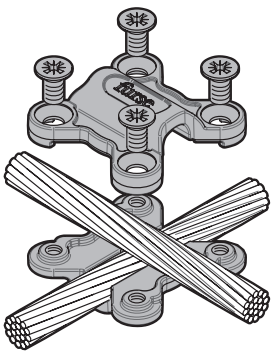
Certification / Standards: ● BS EN 62561-1 Class H.
Manufactured from high quality copper alloy. Simple to install, providing an effective low resistance connection between conductor tape and stranded copper conductor, allowing cross, tee, through and right angle joints to be formed.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
Tightening torque 5 Nm.

Cable to cable square clamp

	Part no.	ABB order code	Conductor size (mm²)	Conductor material	Weight each (kg)	Certification / standards
	CR810-FU	7TCA083660R0015	50	Copper	0.12	●
	CR815-FU	7TCA083660R0016	70	Copper	0.13	●
	CR820-FU	7TCA083660R0017	95	Copper	0.14	●







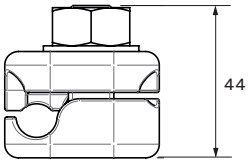
Certification / Standards: ● BS EN 62561-1 Class H.
Manufactured from high quality copper alloy. Simple to install, providing an effective low resistance connection between overlapping stranded conductors allowing cross, tee, through and right angle joints to be formed.
Tightening torque 5 Nm.

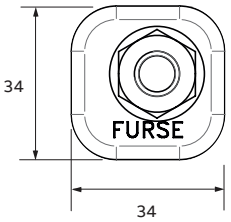
Conductor network

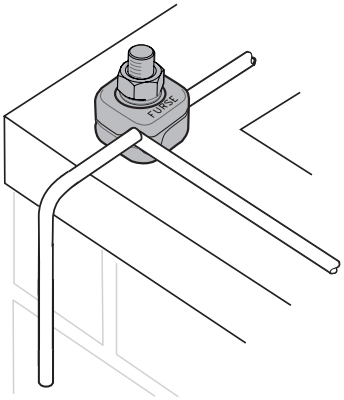
Conductor clamps

Square clamp

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CS605	7TCA083640R0006	Ø8	Copper	0.17	● ●
	CS610	7TCA083640R0007	Ø8	Aluminium	0.07	● ●



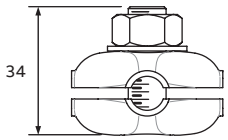


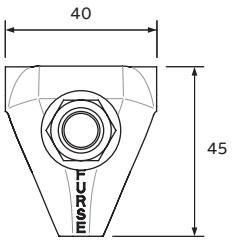


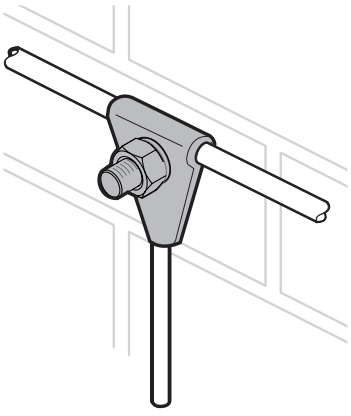
Certification / Standards: ● BS 7430 / ● BS EN 62561-1 Class H / ● BS EN 50164-1 Class H.
Designed to provide low resistance cross joints in solid circular conductor networks.
Manufactured from high quality alloys of either copper or aluminium for excellent corrosion resistance.
Tightening torque 12 Nm.

Tee clamp

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CS505	7TCA083640R0004	Ø8	Copper	0.17	●
	CS510	7TCA083640R0005	Ø8	Aluminium	0.07	● ●







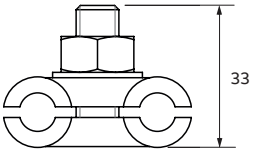
Certification / Standards: ● BS 7430 / ● BS EN 62561-1 Class H.
Designed to provide low resistance tee joints in solid circular conductor networks.
Manufactured from high quality alloys of either copper or aluminium for excellent corrosion resistance.
Tightening torque 12 Nm.

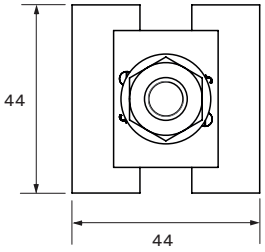
Conductor network

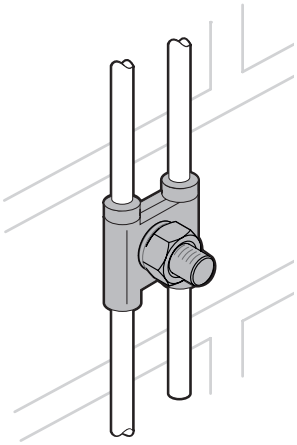
Conductor clamps

Jointing clamp

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CS405	7TCA083640R0002	Ø8	Copper	0.18	● ●
	CS410	7TCA083640R0003	Ø8	Aluminium	0.08	● ●



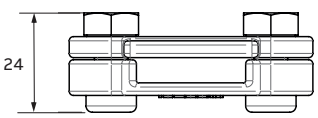


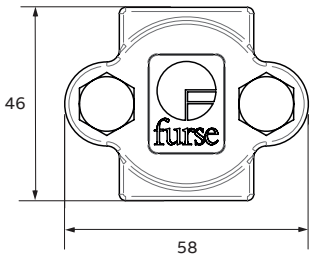


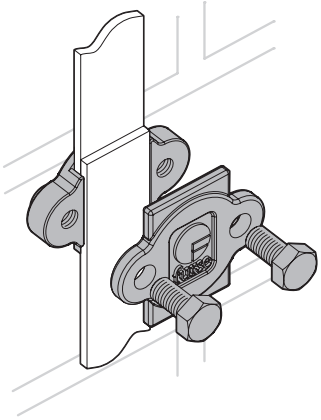
Certification / Standards: ● BS EN 62561-1 Class H / ● BS 7430.
Designed to provide low resistance parallel joints in solid circular conductor networks.
Manufactured from high quality alloys of either copper or aluminium for excellent corrosion resistance.
Tightening torque 12 Nm

Test / Junction clamp

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CN105-H	7TCA083610R0002	26 x 8	Copper	0.15	● ●
	CN005*	7TCA083620R0000	26 x 8	Aluminium	0.12	●





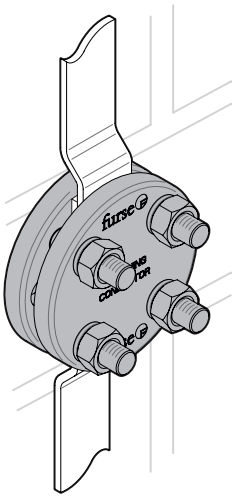


Certification / Standards: ● IEC/BS EN 62561-1 Class H / ● UL96.
Manufactured from high quality alloys of either copper or aluminium. Simple to install, providing an effective low resistance connection between overlapping tapes. The clamped connection is easily made/remade to allow for periodic testing.
Tightening torque CN005 15 Nm; CN105-H 13 Nm.
* Not as illustrated (drawing available on request).

Conductor network
Conductor clamps

Plate type test clamp

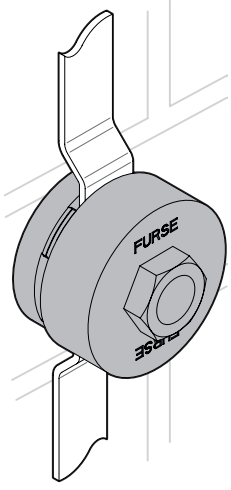
	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CT405	7TCA083610R0023	26 x 12 max	Copper	0.60	● ●



Certification / Standards: ● BS EN 62561-1 Class H / ● BS 7430.
Manufactured from a high quality copper alloy. Simple to install, providing an effective low resistance connection between overlapping tapes.
The clamped connection is easily made/remade to allow for periodic testing. Enables cross, tee, through and right angle joints to be formed.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005) and wall plugs (Part no. PS305).
Tightening torque 15 Nm.

Screwdown test clamp

	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CT305	7TCA083610R0020	26 x 8 max	Copper	0.87	● ●

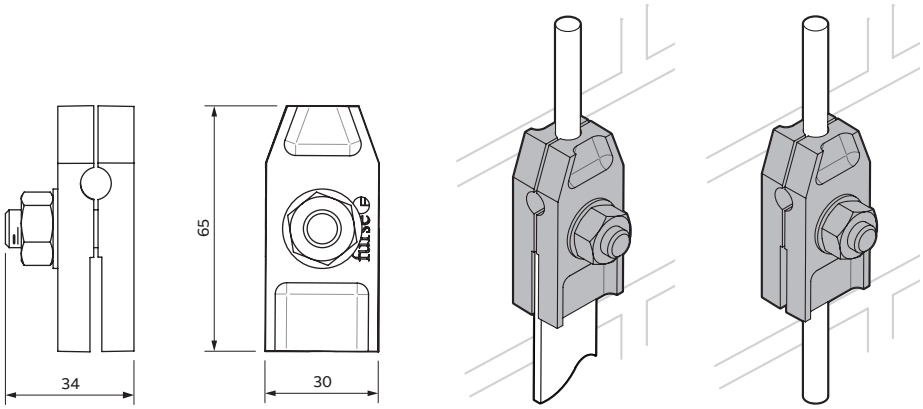


Certification / Standards: ● BS EN 62561-1 Class H / ● BS 7430.
Manufactured from a high quality copper alloy. Simple to install, providing an effective low resistance connection between overlapping tapes.
The clamped connection is easily made/remade to allow for periodic testing. Enables cross, tee, through and right angle joints to be formed.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005) and wall plugs (Part no. PS305).
Tightening torque 20 Nm.

Conductor network
Conductor clamps

Test clamp

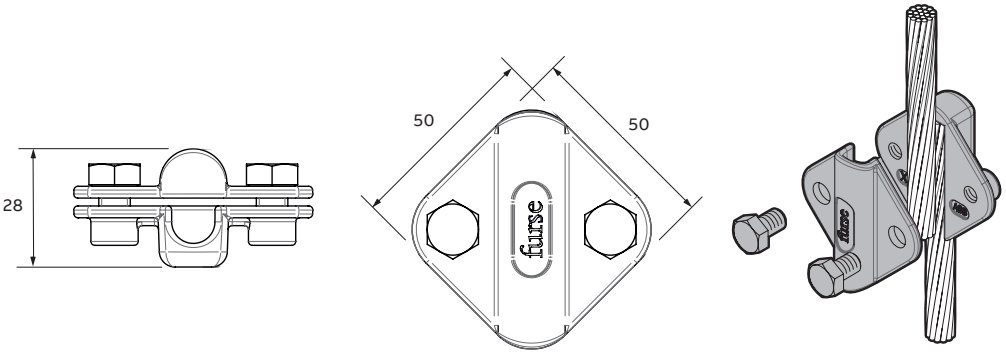
Part no.	ABB order code	Conductor size (mm)	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
CN305	7TCA083640R0000	Ø8	25 x 3	Copper	0.25	● ●
CN310	7TCA083640R0001	Ø8	25 x 3	Aluminium	0.10	● ●



Certification / Standards: ● BS EN 62561-1 Class H / ● BS 7430.
Designed to provide low resistance tee joints in solid circular conductor networks.
These multi-purpose clamps can produce circular to circular or circular to tape connection in both through and tee configurations.
Manufactured from high quality alloys of either copper or aluminium for excellent corrosion resistance.
Tightening torque 12 Nm.

Square test clamp

Part no.	Order code	Conductor diameter (mm²)	Conductor material	Weight each (kg)	Certification / standards
CR855-FU	7TCA083660R0018	50	Copper	0.2	●
CR860-FU	7TCA083660R0019	70	Copper	0.2	●
CR865-FU	7TCA083660R0020	95	Copper	0.2	●



Certification / Standards: ● IEC/BS EN 62561-1 Class H.
Manufactured from high quality copper alloy.
Simple to install, providing an effective low resistance overlap connection between stranded copper cables.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005) and wall plugs (Part no. PS305).
Tightening torque 12 Nm.

Conductor network

Stainless steel bimetallic connectors

Stainless steel bimetallic connector

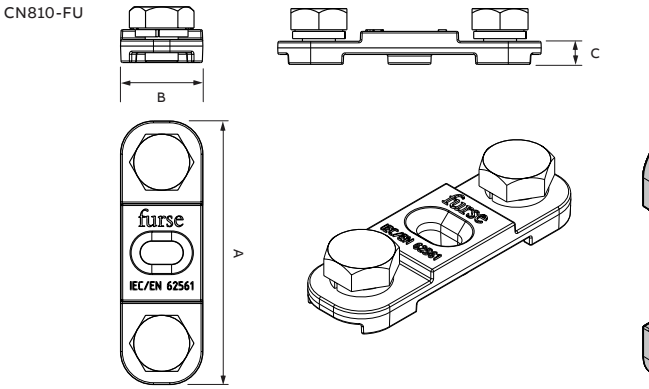
	Part no.	ABB order code	Conductor size (mm)	Conductor size (mm)	Dimensions (mm) A	B	C	Weight each (kg)	Certification / standards
CN810-FU	CN810-FU	7TCA083630R0008	25 x 3	25 x 3	80	25	7	0.12	●
	CN815-FU	7TCA083630R0009	Ø8	Ø8	80	25	17	0.16	●
	CN820-FU	7TCA083630R0010	Ø8	25 x 3	80	25	17 / 7	0.14	

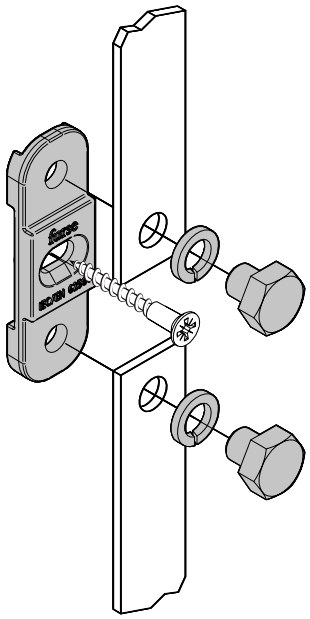
CN810-FU

CN815-FU

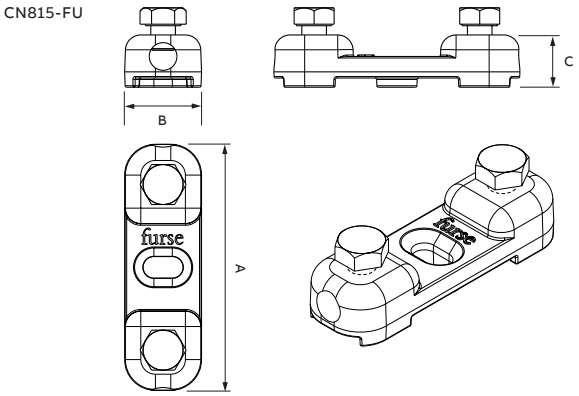
CN820-FU

CN810-FU

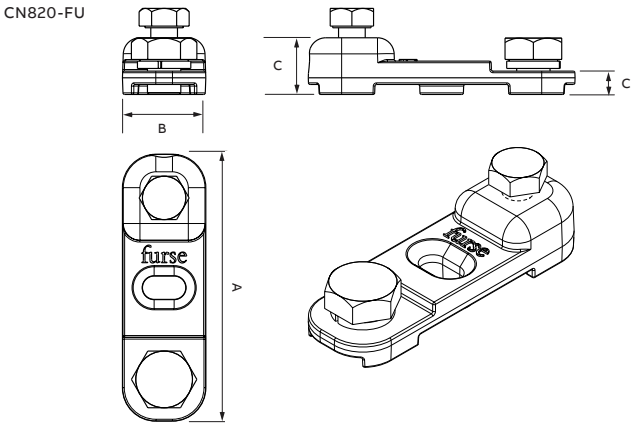




CN815-FU



CN820-FU



Certification / Standards: ● IEC/BS EN 62561-1 Class H.

Conductor network

Bimetallic connectors & expansion braid bond

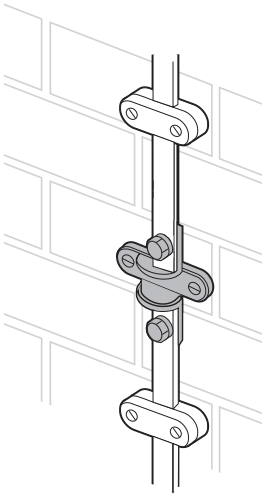
Bimetallic connector

CN910

CN915

CN925

	Part no.	ABB order code	Conductor size (mm)	Weight each (kg)	Certification / standards
	CN910	7TCA083630R0001	25 x 3 mm aluminium tape to 25 x 3 mm copper tape	0.19	●
	CN910-UL	7TCA083630R0002	1½" x ⅛" aluminium tape to 1" x ⅛" copper tape	0.44	●
	CN915	7TCA083650R0001	8 mm Øaluminium conductor to 8 mm Øcopper conductor	0.25	●
	CN920	7TCA083650R0002	8 mm Øaluminium conductor to 25 x 3 mm copper tape	0.21	●
	CN925	7TCA083630R0003	25 x 3 mm aluminium tape to 25 x 3 mm copper tape	0.20	●



Certification / Standards: ● IEC/BS EN 62561-1 Class H / ● UL 96.
Manufactured from a friction welded joint between high conductivity copper and aluminium to provide the ideal means of interconnecting copper and aluminium conductors whilst avoiding bimetallic corrosion.
Fix using countersunk wood screws 1½" No. 10 or M6 (Part no. SW005 or SW105) and wall plugs (Part no. PS305).
Tightening torque 12 Nm.

Expansion braid bond

	Part no.	ABB order code	Type	Conductor material	Length (mm)	Cross-sectional area (mm²)	Weight each (kg)	Certification / standards
	BN101	7TCA083070R0009	Single length	Copper	200	50	0.11	●
	BN001	7TCA083070R0007	Single length	Aluminium	200	50	0.05	●
	BN102	7TCA083070R0011	Cross-over	Copper	300	50	0.50	●
	BN002	7TCA083070R0008	Cross-over	Aluminium	300	50	0.20	●

Certification / Standards: ● BS EN 13602.
Designed to remove the risk of damage or distortion to long conductor runs caused by thermal expansion and contraction.

Conductor network
Accessories

Countersunk wood screws

Part no.	ABB order code	Material	Size	Weight per 100 (kg)
SW105	7TCA083870R1152	Zinc plated steel	1½" x No.10	0.50
SW110	7TCA083870R1153	Zinc plated steel	1½" x No.12	0.60
SW005	7TCA083870R1150	Brass	1½" x No.10	0.50
SW010	7TCA083870R1151	Brass	1½" x No.12	0.60

Roundhead wood screws

Part no.	ABB order code	Material	Size	Weight per 100 (kg)
SW405	7TCA083870R1155	Zinc plated steel	1½" x No.10	0.50
SW305	7TCA083870R1154	Brass	1½" x No.10	0.50

Countersunk set screws

Part no.	ABB order code	Material	Size (mm)	Weight per 100 (kg)
SS160	7TCA083870R1135	Brass	M6 x 30	0.60
SS260	7TCA083870R1690	Stainless Steel 316	M6 x 30	0.61

Hexagon head set screws

Part no.	ABB order code	Material	Size (mm)	Weight per 100 (kg)
SS635	7TCA083870R1139	Phosphor bronze	M10 x 25	2.85
SS640	7TCA083870R1140	Phosphor bronze	M10 x 35	3.40
SS650	7TCA083870R1142	Phosphor bronze	M12 x 25	4.50
SS655	7TCA083870R1145	Phosphor bronze	M12 x 35	5.00
SS165	7TCA083870R1136	Brass	M8 x 16	1.75
SS140	7TCA083870R1131	Brass	M10 x 25	2.50
SS145	7TCA083870R1132	Brass	M10 x 35	3.20
SS150	7TCA083870R1133	Brass	M12 x 25	3.80
SS155	7TCA083870R1134	Brass	M12 x 35	4.70
SS235	7TCA083870R1590	Stainless Steel 316	M8 x 20	1.23
SS240	7TCA083870R1592	Stainless Steel 316	M10 x 25	2.57
SS245	7TCA083870R1503	Stainless Steel 316	M10 x 35	3.07

Conductor network
Accessories

Plastic wall plugs

Part no.	ABB order code	Size	Weight per 100 (kg)	Colour
PS305	7TCA083870R1105	No.10	0.06	Red
PS310	7TCA083870R1106	No.12	0.06	Brown

Roundhead rivets

Part no.	ABB order code	Material	Size (mm)	Weight per 100 (kg)
RV105	7TCA083870R1116	Copper	5 x 12	0.35
RV110	7TCA083870R1117	Copper	5 x 20	0.45

Hexagon nuts

Part no.	ABB order code	Material	Size	Weight per 100 (kg)
NU367	7TCA083870R1091	Phosphor bronze	M10	1.25
NU370	7TCA083870R1092	Phosphor bronze	M12	1.80
NU165	7TCA083870R1086	Brass	M6	0.25
NU166	7TCA083830R0074	Brass	M8	0.80
NU167	7TCA083870R1087	Brass	M10	1.15
NU170	7TCA083870R1088	Brass	M12	1.65
NU265	7TCA083870R1559	Stainless Steel 316	M6	0.25
NU266	7TCA083870R1572	Stainless Steel 316	M8	0.52
NU267	7TCA083870R1504	Stainless Steel 316	M10	1.16

Spring washers

Part no.	ABB order code	Material	Size (mm)	Weight per 100 (kg)
WS365	7TCA083870R1233	Phosphor bronze	6	0.04
WS367	7TCA083870R1235	Phosphor bronze	10	0.20
WS370	7TCA083870R1236	Phosphor bronze	12	0.20
WS265	7TCA083870R1558	Stainless steel 316	6	0.04
WS266	7TCA083870R1568	Stainless steel 316	8	0.10
WS267	7TCA083870R1506	Stainless steel 316	10	0.20

Conductor network
Accessories

Roundhead copper nails

	Part no.	ABB order code	Length (mm)	Weight per 100 (kg)
	NA005	7TCA083870R1085	50	0.70

Plain washers

	Part no.	ABB order code	Material	Size (mm)	Weight per 100 (kg)
	WR365	7TCA083870R1228	Phosphor bronze	6	0.05
	WR367	7TCA083870R1230	Phosphor bronze	10	0.25
	WR370	7TCA083870R1231	Phosphor bronze	12	0.50
	WR165	7TCA083870R1224	Brass	6	0.05
	WR175	7TCA083870R1227	Brass	8	0.15
	WR167	7TCA083870R1225	Brass	10	0.25
	WR170	7TCA083870R1226	Brass	12	0.50
	WR265	7TCA083870R1560	Stainless Steel 316	6	0.06
	WR266	7TCA083870R1573	Stainless Steel 316	8	0.11
	WR267	7TCA083870R1505	Stainless Steel 316	10	0.21

Insulating tape

	Part no.	ABB order code	Size	Weight each (kg)
	TP120-FU	7TCA083870R1193	25 mm x 33 m	0.15

Green/yellow general purpose insulating tape.

Conductor network
Accessories

Waterproofing tape

	Part no.	ABB order code	Size	Weight each (kg)
	TD005	7TCA083870R1158	50 mm x 10 m	0.70

A waterproof tape for wrapping underground joints.
COSHH datasheet available on request.

Silfos

	Part no.	ABB order code	Coil size	Thickness (mm)	Weight each (kg)
	FS005	7TCA083870R0776	50 mm x 8 m	0.12	0.50

An alloy of silver, phosphorous and copper. Used to braze copper in air without the use of Flux.
CoSHH datasheet available on request.

Oxide inhibiting compound

	Part no.	ABB order code	Description	Weight each (kg)
	CM005	7TCA083930R0003	Plastic 8 oz bottle	0.27

When installing mechanical and compression connectors, use oxide inhibiting compound to reduce risk of corrosion.

Earthing
Introduction

Furse earthing components are manufactured to meet exacting British, European and International standards to ensure robust, long lasting performance in even the harshest soil conditions.

All components are designed to withstand mechanical damage and the thermal and electromechanical stresses from the earth fault and leakage currents expected within an installation.

These components, combined together, form the earth termination system - the vital system for dispersing those dangerous lightning and fault currents safely and effectively into the ground.

Following National & International standards, we recommend a single integrated earth termination system for a structure, connecting lightning protection earthing to power and telecommunication system earthing.

This integrated approach ensures all systems are appropriately cross-bonded and earthed, to fully safeguard against the risk of voltage differences which might otherwise give rise to flashover or electric shock.

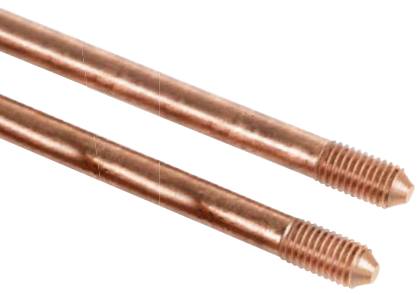
Furse earthing and equipotential bonding products offer the surest solution to this problem.

From pipe clamps and metalwork bonds to connect to accessible metal parts, to low resistance copper conductor and high quality earth rods for the earthing arrangement - Furse products are designed to perform.

And where our standard range doesn't quite fit your requirements, with full design and manufacturing capability we can design a special component to suit.

— 01 Threaded copperbond earth rods
— 02 Polymer inspection pit
— 03 Earth bars
— 04 Earth enhancing backfill

— 01



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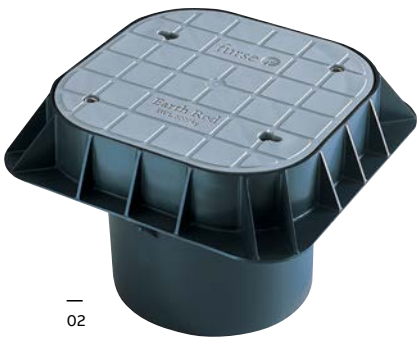

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Earthing
Product selection guide

An effective earthing system is a fundamental requirement of any modern structure or system for operational and/or safety reasons. Without such a system, the safety of a structure, the equipment contained within it and its occupants are compromised.

Earthing systems typically fall into (but are not limited to) one of the following categories:
- Power generation, transmission and distribution
- Lightning protection
- Control of undesirable static electricity
- Telecommunications

Conductors and earth electrodes

As with lightning protection, the first choice faced by the designer of an earthing system is the type of conductor to be used. The correct choice of conductor is extremely important, whether it be a simple below ground electrode or a complex computer room signal reference grid.

1. Conductors
We offer three types of conductor:
- Flat tape
- Solid circular
- Stranded cable

It is important that earthing conductors should be correctly sized for their application, as they may be required to carry a considerable current for several seconds. A range of conductor materials is available. Above ground, copper, aluminium and steel may be used. Below ground, copper is the most common choice due to its high resistance to corrosion.

In addition to the conductors, earth rods and plates or any combination thereof can be used to achieve an effective earth depending on the site conditions.

2. Earth rods
Earth rods take advantage of lower resistivity soils at greater depths than normal excavation will allow.

3. Earth plates
Earth plates are used to attain an effective earth in shallow soils with underlying rocks or in locations with large amounts of buried services. They can also provide protection at potentially dangerous places, e.g. HV switching positions.

Connectors and terminations

An effective earthing system relies on joints and connections to have good electrical conductivity with high mechanical strength. Poorly chosen or badly installed joints and connectors can compromise the safe operation of an earthing system. We offer a range of connectors and termination methods to suit a wide range of applications:

4. Compression connectors
For applications where exothermic welding is not appropriate for creating permanent connections, compression connectors may be used.

Compression connectors produce very robust joints which can be buried in the ground or in concrete.

5. Mechanical clamps
Where permanent connections are not appropriate, mechanical clamps offer the ideal solution. These are typically used on smaller scale installations where periodic disconnection for testing is required.

All Furse mechanical clamps are manufactured from high copper content alloy. They have high mechanical strength, excellent corrosion resistance and conductivity.

6. Earth inspection pits
Regular inspection and testing of the earthing system is essential. Inspection pits allow easy access to earth electrodes and conductors to facilitate this procedure.

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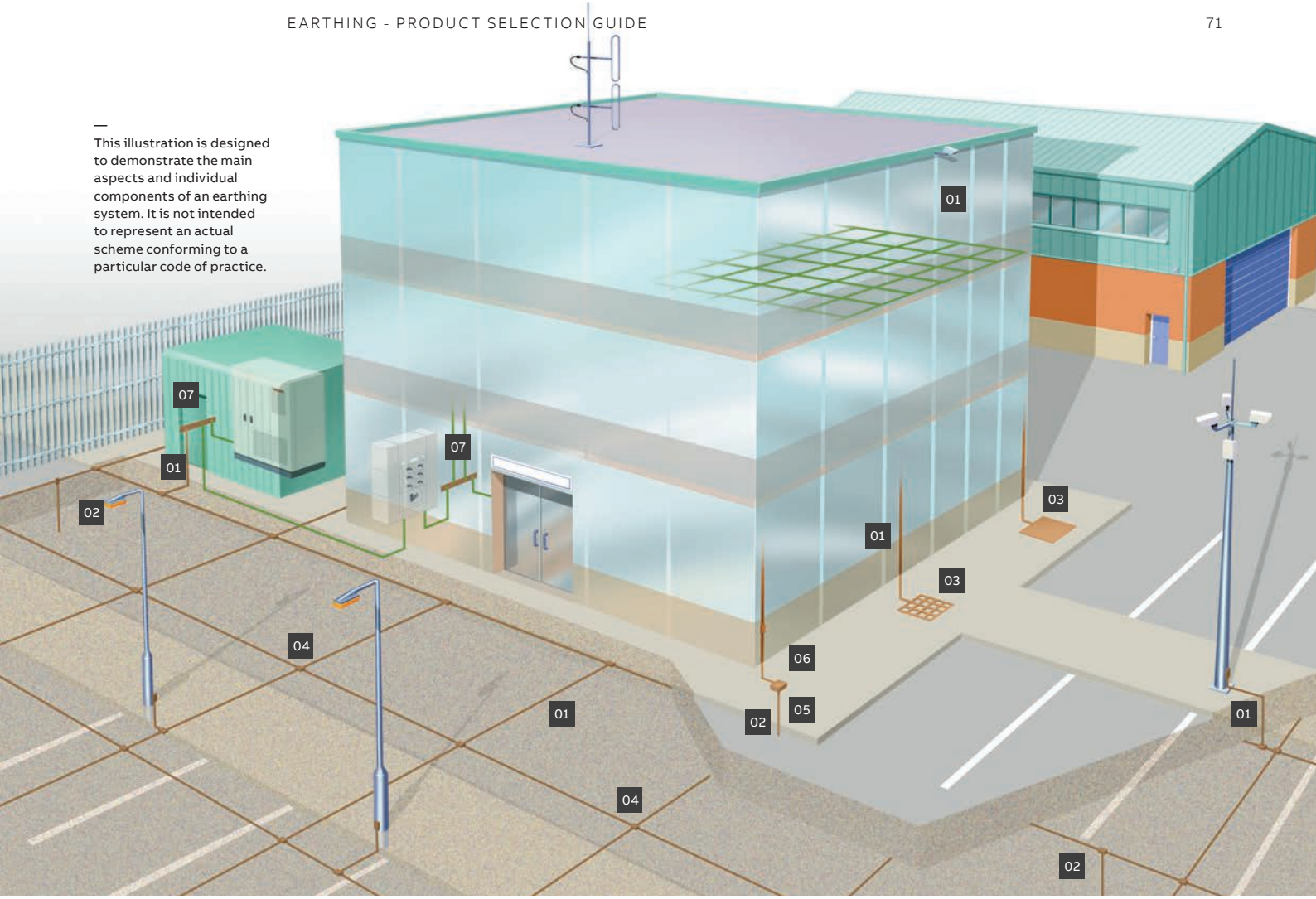
This illustration is designed to demonstrate the main aspects and individual components of an earthing system. It is not intended to represent an actual scheme conforming to a particular code of practice.



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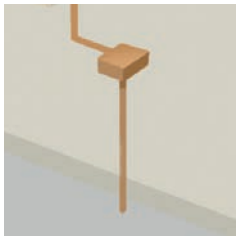

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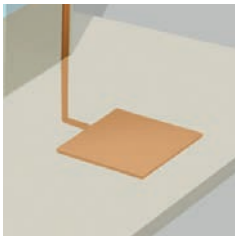

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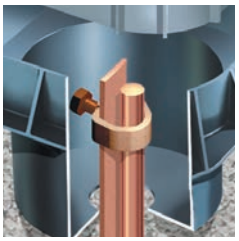

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Product selection guide - Earthing

No.	Type	Page No.
1.	Conductors	20
2.	Earth rods	74
3.	Earth plates	79
4.	Compression connectors	101
5.	Mechanical clamps	81
6.	Earth inspection pits	78
7.	Earth bars	96
8.	Earth electrode backfills	80

7. Earth bars
Earth bars are an efficient and convenient way of providing a common earth point. Integral disconnecting links mean the earth bars can be isolated for testing purposes.

8. Earth electrode backfills
Earth electrode backfills are to be used in areas where required resistance levels are difficult to achieve. These products effectively act to increase the electrode's surface area thus lowering its resistance to earth.

Earthing
Earth electrodes

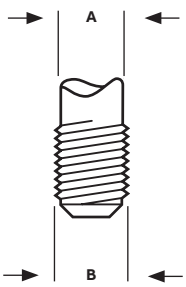
Three types of Furse earth rod are available, but the copperbonded steel cored rod is by far the most popular, due to its combination of strength, corrosion resistance and comparatively low cost.

Quality earth rods are commonly made from either copperbonded steel, solid copper or stainless steel. Solid copper and stainless steel rods offer a very high level of corrosion resistance at the expense of lower strength and higher cost.

Copperbond rod
Furse copperbond earth rods probably offer to the installer the best and most economical earth rods available. They are made by molecularly bonding 99.9% pure electrolytic copper on to a low carbon steel core. Furse rods are not of the sheathed type. They are highly resistant to corrosion, and because the steel used has a very high tensile strength, they can be driven by power hammers to great depths. The counter-bored couplings are made from high copper content alloy, commercial brass is not used.

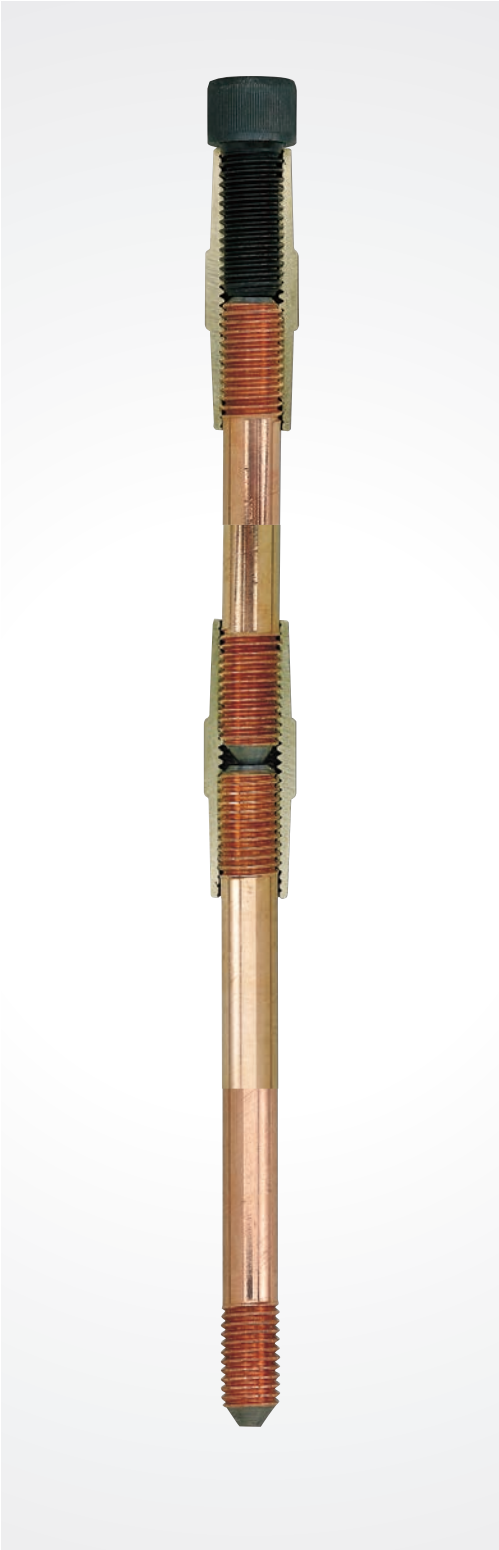
Solid copper rod
Furse solid copper earth rods offer greater resistance to corrosion. They are ideally used in applications where soil conditions are very aggressive, such as soils with high salt content.

Stainless steel rod
Stainless steel rods are used to overcome many of the problems caused by galvanic corrosion which can take place between dissimilar metals buried in close proximity. Furse stainless steel earth rods are highly resistant to corrosion.



Thread and shank diameters
Confusion often arises between thread and shank diameters for threaded rods.

The thread rolling process, used by quality rod manufacturers, raises the surface of the rod so that thread diameter (B) is greater than shank diameter (A) (see drawing). All threads are Unified National Coarse (UNC-2A).



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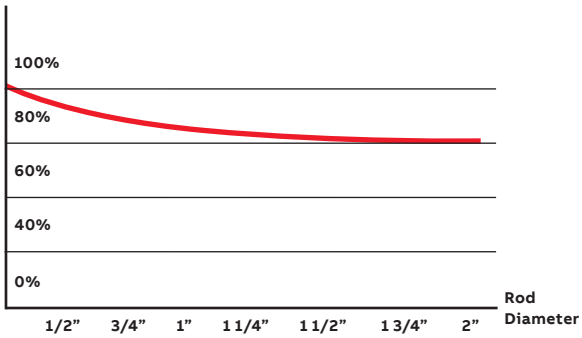
Effect of electrode diameter on resistance



Diameter of rod

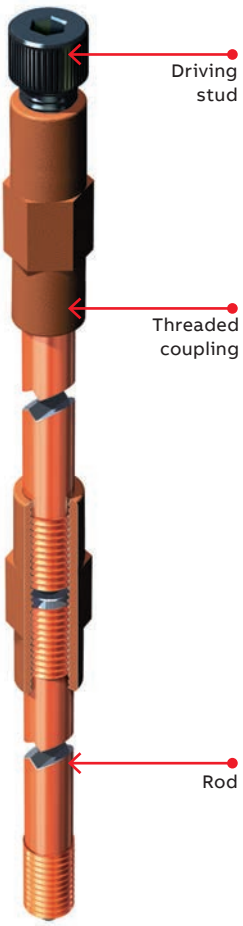
One common misconception is that the diameter of the rod has a drastic effect on lowering earth resistance. This is not true! As the graph shows, you only lower the resistance value by 9.5% by doubling the diameter of the rod (which means increasing the weight and the cost of the rod by approximately 400%).

Thus the rationale is: Use the most economical rod that soil conditions will allow you to drive. This is one of the ways to ensure that you don’t waste money on over-dimensioned rods.

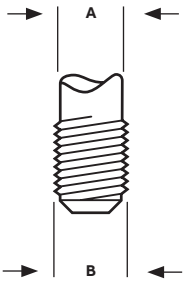
Earth electrodes

Earth rods

Threaded copperbond earth rod



Part no.	ABB order code	Nominal diameter (")	Length (mm)	Shank 'A' (mm)	Thread 'B' UNC (")	Weight each (kg)	Certification / standards
RB105	7TCA083120R0014	Ø½	1,200	12.7	9/16	1.18	●
RB110	7TCA083120R0016	Ø½	1,500	12.7	9/16	1.55	●
RB115	7TCA083120R0017	Ø½	1,800	12.7	9/16	1.76	●
RB125	7TCA083120R0019	Ø½	2,400	12.7	9/16	2.36	●
RB205-FU	7TCA083120R0024	Ø⅝	1,200	14.2	⅝	1.53	● ●
RB210	7TCA083120R0028	Ø⅝	1,500	14.2	⅝	1.88	● ●
RB215	7TCA083120R0034	Ø⅝	1,800	14.2	⅝	2.29	● ●
RB220-FU	7TCA083120R0040	Ø⅝	2,100	14.2	⅝	2.51	● ●
RB225	7TCA083120R0043	Ø⅝	2,400	14.2	⅝	3.00	● ●
RB235	7TCA083120R0047	Ø⅝	3,000	14.2	⅝	3.79	● ●
RB305	7TCA083120R0049	Ø¾	1,200	17.2	¾	2.19	● ●
RB310	7TCA083120R0054	Ø¾	1,500	17.2	¾	2.73	● ●
RB315	7TCA083120R0058	Ø¾	1,800	17.2	¾	3.27	● ●
RB320-FU	7TCA083120R0063	Ø¾	2,100	17.2	¾	3.83	● ●
RB325	7TCA083120R0066	Ø¾	2,400	17.2	¾	4.35	● ●
RB335	7TCA083120R0069	Ø¾	3,000	17.2	¾	5.44	● ●
UL Listed copperbond earth rod							
RB225-UL	7TCA083120R0087	Ø⅝	2,440	14.2	⅝	3.00	● ●
RB235-UL	7TCA083120R0092	Ø⅝	3,048	14.2	⅝	3.79	● ●
RB325-UL	7TCA083120R0088	Ø¾	2,440	17.2	¾	4.35	● ●
RB335-UL	7TCA083120R0089	Ø¾	3,048	17.2	¾	5.44	● ●



Fittings

Part no.	ABB order code	Type (")	Weight each (kg)	Certification / standards
CG170	7TCA083160R0005	½ Coupling	0.09	●
CG270	7TCA083160R0007	⅝ Coupling	0.08	● ● ●
CG370	7TCA083160R0011	¾ Coupling	0.13	● ● ●
ST100	7TCA083160R0052	½ Driving stud	0.05	●
ST200	7TCA083160R0054	⅝ Driving stud	0.08	●
ST300	7TCA083160R0059	¾ Driving stud	0.12	●

Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-2 / ● UL 467.
High tensile low carbon steel core with minimum 250 microns of copper.

Earth electrodes

Earth rods

Unthreaded copperbond earth rod

Part no.	ABB order code	Diameter (mm)	Length (mm)	Weight each (kg)	Certification / standards
RB005	7TCA083120R0011	Ø9.0	1,200	0.62	●
RB107	7TCA083120R0015	Ø12.7	1,500	1.55	●
RB203	7TCA083120R0020	Ø14.2	1,200	1.53	● ●
RB213	7TCA083120R0031	Ø14.2	1,500	1.88	● ●
RB236	7TCA083120R0096	Ø14.2	3,000	3.79	● ●
RB317	7TCA083120R0062	Ø17.2	2,000	3.64	● ●
RB326	7TCA083120R0067	Ø17.2	2,400	4.35	● ●
RB336	7TCA083910R2211	Ø17.2	3,000	5.44	● ●
UL Listed copperbond earth rod					
RB226-UL	7TCA083120R0101	Ø14.2	2,440	3.00	● ●
RB236-UL	7TCA083120R0102	Ø14.2	3,048	3.79	● ●
RB326-UL	7TCA083120R0068	Ø17.2	2,440	4.35	● ●
RB336-UL	7TCA083120R0103	Ø17.2	3,048	5.44	● ●

Fittings

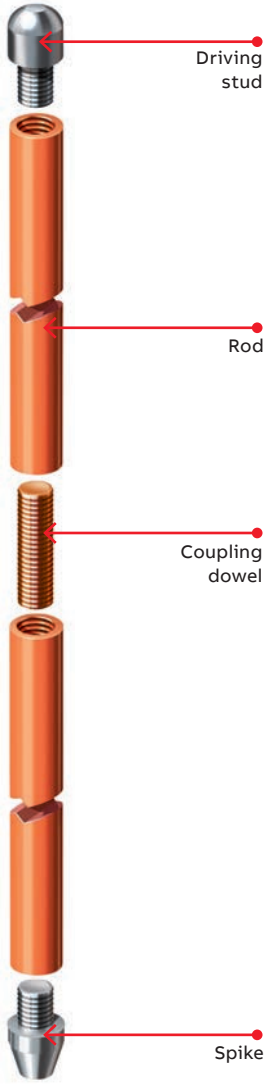
Part no.	ABB order code	Type	Weight each (kg)	Certification / standards
CG177	7TCA083160R0006	12.7 mm Coupling	0.09	●
CG277	7TCA083160R0009	14.2 mm Coupling	0.08	●
CG377	7TCA083160R0012	17.2 mm Coupling	0.13	●
ST107	7TCA083160R0053	12.7 mm Driving head	0.25	●
ST207	7TCA083160R0056	14.2 mm Driving head	0.22	●
ST307	7TCA083160R0060	17.2 mm Driving head	0.27	●

Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-2 / ● UL 467.
High tensile low carbon steel core with minimum 250 microns of copper.
Other lengths available to order.

Earth electrodes

Earth rods

Solid copper and stainless steel earth rod



Part no.	ABB order code	Diameter (mm)	Length (mm)	Weight each (kg)	Certification / standards
Solid copper rod					
RC010	7TCA083110R0018	Ø15	1,200	1.88	● ●
RC011	7TCA083110R0021	Ø15	1,500	2.35	● ●
RC012	7TCA083110R0022	Ø15	3,000	4.70	● ●
RC015	7TCA083110R0023	Ø20	1,200	3.34	● ●
RC016	7TCA083110R0025	Ø20	1,500	4.18	● ●
RC017	7TCA083110R0026	Ø20	3,000	8.36	● ●
Solid copper rod kit					
RC010-KIT	7TCA083110R0019	Ø15	8 ft (2,440 mm)	3.82	● ●
RC015-KIT	7TCA083110R0024	Ø20	8 ft (2,440 mm)	6.79	● ●
Stainless steel rod					
RS005	7TCA083130R0046	Ø16	1,200	1.87	●
RS011	7TCA083130R0048	Ø16	1,500	2.34	●
RS012	7TCA083130R0049	Ø16	3,000	4.68	●
RS015	7TCA083130R0116	Ø20	1,200	2.95	● ●
RS016	7TCA083130R0050	Ø20	1,500	3.65	●
RS017	7TCA083130R0051	Ø20	3,000	7.30	●
Stainless steel rod kit					
RS005-KIT	7TCA083130R0047	Ø16 mm	8 ft (2,440 mm)	3.80	● ●

Fittings

Part no.	ABB order code	Type	Weight each (kg)	Certification / standards
ST010	7TCA083160R0050	15 mm hardened steel driving stud for copper/stainless steel rod	0.02	●
ST015	7TCA083160R0051	20 mm hardened steel driving stud for copper/stainless steel rod	0.05	●
CG013	7TCA083160R0004	Coupling dowel for 15 mm & 20 mm copper rod	0.02	●
CG005	7TCA083160R0003	Coupling dowel for 16 mm & 20 mm stainless steel rod	0.02	●
SP010-FU	7TCA083160R0087	15 mm hardened steel spike for copper/stainless steel rod	0.02	●
SP015-FU	7TCA083160R0088	20 mm hardened steel spike for copper/stainless steel rod	0.04	●

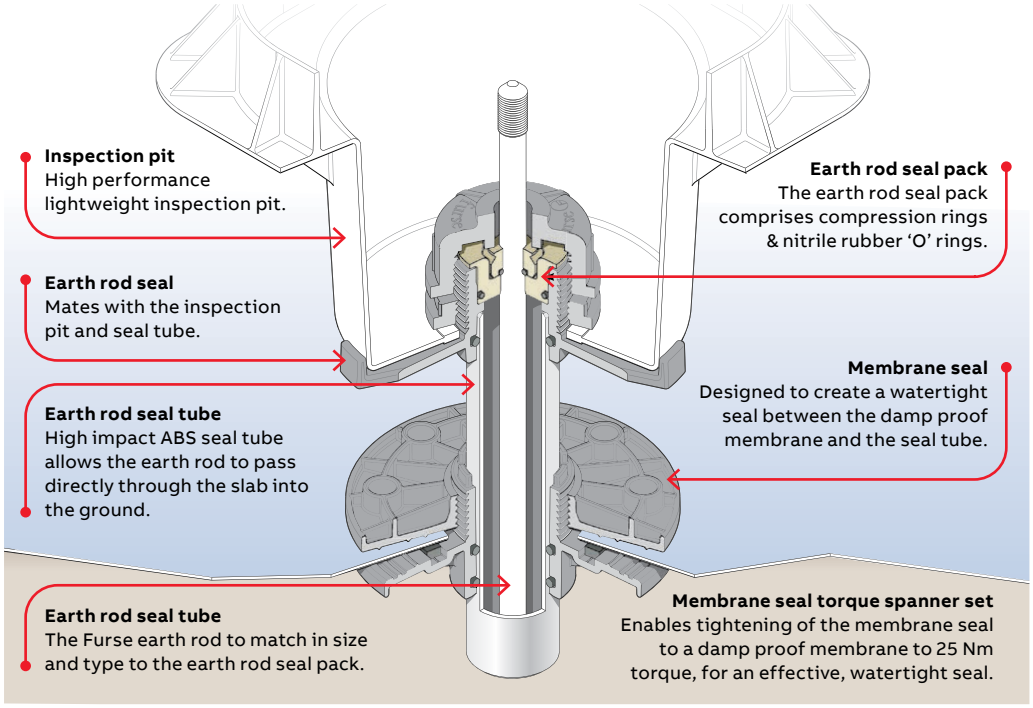
Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-2 / ● UL 467.

Earth electrodes

Earth rod seal

Earth rod seal

Part no.	ABB order code	Description	Weight each (kg)	Certification / standards
Earth rod seal assembly				
ES300	7TCA083350R0023	Earth rod seal and membrane seal	0.75	●
Earth rod seal pack				
ES300-12	7TCA083350R0024	Seal pack for ½" (Ø12.7 mm) copperbond rod	0.06	●
ES300-58	7TCA083350R0029	Seal pack for ⅝" (Ø14.2 mm) copperbond rod	0.06	●
ES300-34	7TCA083350R0028	Seal pack for ¾" (Ø17.2 mm) copperbond rod	0.06	●
ES300-15	7TCA083350R0025	Seal pack for Ø15 mm solid copper rod	0.06	●
ES300-16	7TCA083350R0026	Seal pack for Ø16 mm stainless steel rod	0.06	●
ES300-20	7TCA083350R0027	Seal pack for Ø20 mm solid copper rod/ stainless steel rod	0.06	●
Earth rod seal tube				
ES310-03	7TCA083350R0030	Seal tube, 300 mm length	0.16	●
ES310-05	7TCA083350R0031	Seal tube, 500 mm length	0.27	●
ES310-10	7TCA083350R0032	Seal tube, 1,000 mm length	0.54	●
ES310-15	7TCA083340R0018	Seal tube, 1,500 mm length	0.81	●
ES310-20	7TCA083340R0019	Seal tube, 2,000 mm length	1.08	●
ES310-30	7TCA083340R0020	Seal tube, 3,000 mm length	1.62	●
Accessory spanner set				
ES320	7TCA083350R0069	Membrane seal torque spanner set	0.45	●

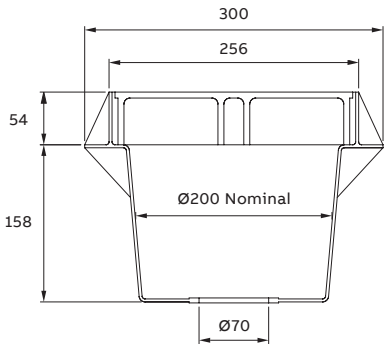


Certification / Standards: ● IEC/BS EN 62561-5.
When specifying a Furse earth rod seal, ensure that all relevant components are ordered - earth rod assembly, seal pack, seal tube, accessory spanner set and lightweight inspection pit. The accessory spanner set may be used for multiple earth rod seal installations.
Please specify the correct size of earth rod seal pack for the earth rod, and the correct length of protective seal tube when ordering.
Note: earth rod seal designed for use with clean, smooth Type 'A' damp proof membranes as defined by BS EN 13967, without the need for adhesive, sealant or mastic.
For uneven, textured or tanking damp proof membranes, if installed, or where hydrostatic conditions exist, adhesive, sealant or mastic should be applied.

Earth electrodes
Inspection pits

Lightweight inspection pit

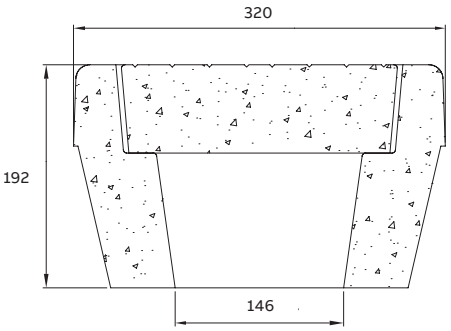
Part no.	ABB order code	Description	Load rating (kg)	Weight each (kg)	Certification/ standards
PT205	7TCA083320R0011	Lightweight inspection pit with grey polymer lid	5,000	1.80	●
Earth bar for lightweight inspection pit					
PT004	7TCA083340R0014	5 hole earth bar		0.40	●
Accessories for polymer lid					
AK005	7TCA083320R0000	6 mm Allen key		0.03	
Accessories for concrete lid					
JH100	7TCA083320R0005	M8 x 100 mm long mild steel 'J' bolt lifting hook		0.04	
AS100	7TCA083320R0002	M8 x 60 stainless steel Allen caphead screw (2 per lid)		0.03	



Certification / Standards: ● IEC/BS EN62561-5 / ● BS 7430.
Manufactured from high-performance, UV stable and chemically resistant polymer with either polymer or concrete lid to suit the application.
The lightweight inspection pit with polymer lid is load rated to 5,000 kg and is suitable for general to heavy duty use. It has a lockable lid and improved working area compared to the concrete inspection pit.
*Not illustrated (drawing available on request).

Concrete inspection pit

Part no.	ABB order code	Description	Weight each (kg)	Certification/ standards
PT005	7TCA083310R0007	Concrete inspection pit	30.00	●
Earth bars for concrete inspection pit				
PT006	7TCA083340R0015	5 hole earth bar	0.40	●
PT007	7TCA083340R0017	7 hole earth bar	0.58	●



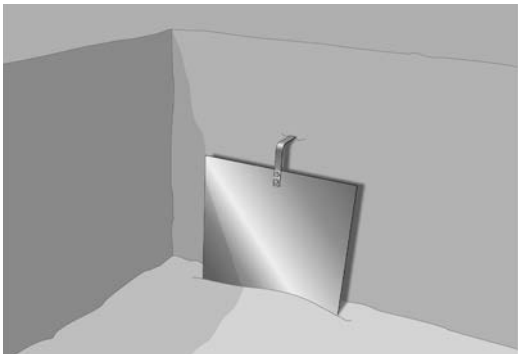
Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-5.
The concrete inspection pit is load rated to 3,500 kg and is suitable for most types of earthing and lightning protection installations
It is not suitable for use in areas where high load, small wheel vehicles are used. The lightweight inspection pit (PT205) is recommended for this type of application

Earth electrodes

Earth plate & lattice

Earth plate (solid copper)

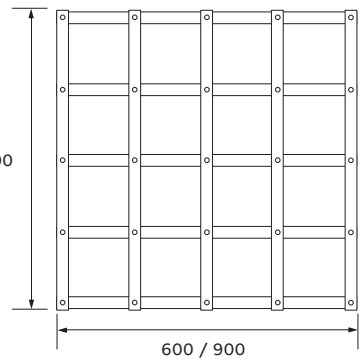
Part no.	ABB order code	Dimensions (mm)	Total surface area (m^2)	Weight each (kg)	Certification/ standards
PE005	7TCA083150R0017	600 x 600 x 1.5	0.72	5.00	●
PE015	7TCA083150R0019	900 x 900 x 1.5	1.63	11.21	●
PE010	7TCA083150R0018	600 x 600 x 3	0.73	9.74	●
PE020	7TCA083150R0020	900 x 900 x 3	1.63	21.74	●

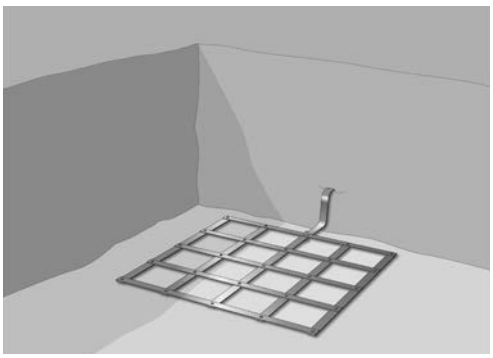


Certification / Standards: ● BS EN 13599.
Solid copper earth plates offer a simple alternative style of earth electrode where high resistivity soil or rock conditions prohibit the driving of earth rods.

Earth mat (lattice copper)

Part no.	ABB order code	Dimensions (mm)	Total surface area (m^2)	Weight each (kg)	Certification/ standards
PE110	7TCA083150R0022	600 x 600 x 3	0.31	3.98	●
PE120	7TCA083150R0023	900 x 900 x 3	0.65	7.20	●





Certification / Standards: ● BS EN 13601.
Manufactured from high conductivity copper tape, lattice earth mats are designed to minimize the danger of exposure to high step and touch voltages to operators in situations such as High Voltage switching.

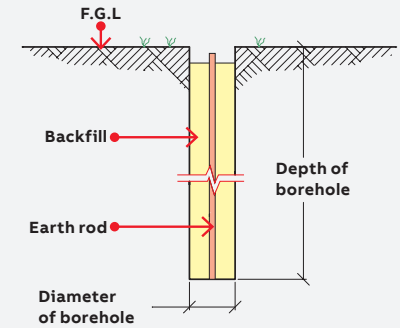
Earth electrodes
Backfill materials

FurseCEM® conductive aggregate

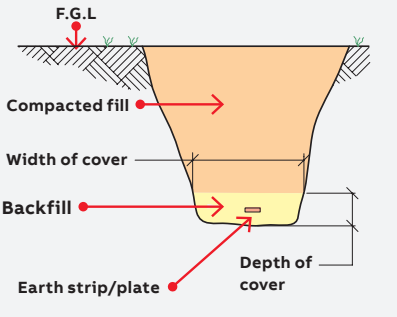
*Conductive earthing mix supplied with cement

Part no.	ABB order code	Description	Weight each (kg)	Certification/ standards
CM035	7TCA083870R1818	FurseCEM®	25.00	●
CM040	7TCA083870R1819	FurseCEM® Premix*	25.00	●
CM045	7TCA083870R2019	FurseCEM® Low Density	25.00	●
CM050	7TCA083870R2020	FurseCEM® Low Density Premix*	25.00	●

Borehole Procedure



Trench Procedure

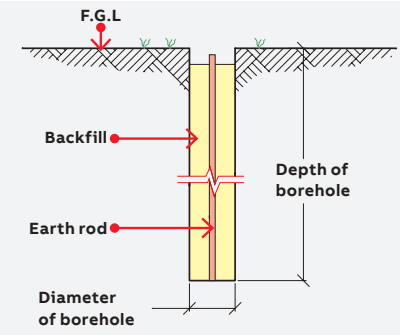


Certification / Standards: ● IEC/BS EN 62561-7.
Certain ground conditions make it difficult to obtain a reliable earth resistance, whilst particular installations may require a very low resistance. In such cases, FurseCEM® provides a convenient and permanent solution. By adding FurseCEM® in place of sand and aggregate, to cement, a conductive concrete is formed. This electrically conductive medium has many applications in the electrical/construction industry, including RF and microwave screening, static control and, of course, earthing, for which it was specifically developed. When used as a backfill for earth electrodes, FurseCEM® impregnated concrete greatly increases the electrode's surface area thus lowering its resistance to earth.
For further information on FurseCEM®, please contact the Furse sales office.

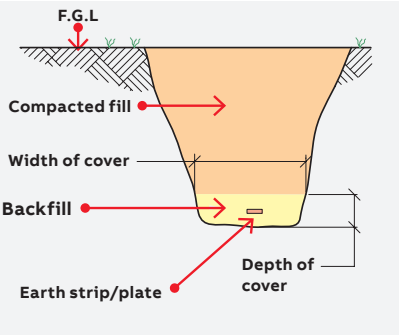
Bentonite moisture retaining clay

Part no.	ABB order code	Description	Weight each (kg)
CM015	7TCA083870R0030	Bentonite powder	25.00
CM020	7TCA083870R0032	Bentonite granules	25.00

Borehole Procedure



Trench Procedure



Used as an earth-electrode backfill to reduce soil resistivity by retaining moisture. The clay is a sodium activated montmorillonite, which when mixed with water swells to many times its dry volume. It has the ability to hold its moisture content for a considerable period of time and to absorb moisture from the surrounding soil (e.g. from rainfall).
CoSHH datasheet available on request.

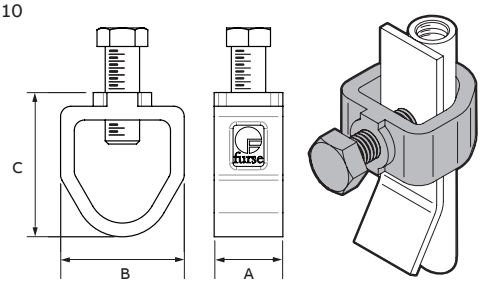
Earth bonds & clamps

Mechanical clamps

Rod to tape clamp (type A)

Part no.	ABB order code	Nominal rod diameter (")	Nominal rod diameter (mm)	Max. conductor (mm)	Dimensions (mm) A	B	C	Weight each (kg)	Certification/ standards
CR105	7TCA083210R0004	Ø½	Ø12.7	26 x 12	20	36	42	0.15	● ●
		Ø⅝	Ø16	26 x 12					
		Ø¾	Ø20	26 x 10					
CR110	7TCA083210R0008	Ø⅝	Ø16	40 x 12	23	58	48	0.24	●
CR115	7TCA083210R0009	Ø⅝	Ø16	51 x 8	22	70	49	0.30	●
CR125	7TCA083210R0010	Ø¾	Ø20	51 x 12	23	68	55	0.30	●
CR130	7TCA083210R0011	Ø½	Ø12.7	26 x 20	22	41	54	0.23	●
		Ø⅝	Ø16	26 x 18					
		Ø¾	Ø20	26 x 10					
		Ø1	Ø25	26 x 10					

CR105

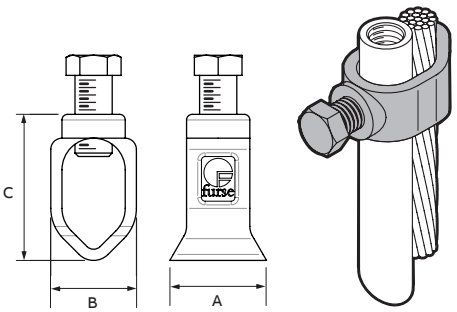


Certification / Standards: ● BS 7430 / ● BS EN 62561-1 Class H.
Designed for connection of flat tape conductor to an earth rod. Corrosion resistance, conductivity and mechanical strength are essential considerations in clamp design to ensure an earthing system remains operative for many years. All Furse earth rod clamps have high strength copper alloy bodies and screws, e.g. aluminium bronze, phosphor bronze etc., commercial brass is not used.
Tightening torque 15 Nm.

Rod to cable clamp (type G)

Part no.	ABB order code	Nominal rod diameter (")	Nominal rod diameter (mm)	Dimensions (mm) A	B	C	Conductor range (mm²)	Weight each (kg)	Certification/ standards
CR505	7TCA083220R0008	Ø⅜	Ø9.5	19	20	30	6-35	0.03	●
CR510-FU*	7TCA083220R0009	Ø½	Ø12.7	22	22	33	16-50	0.05	●
CR515*	7TCA083220R0010	Ø⅝	Ø16	26	23	39	16-70	0.06	● ●
CR520*	7TCA083220R0012	Ø¾	Ø20	28	27	45	35-95	0.06	● ●

CR515



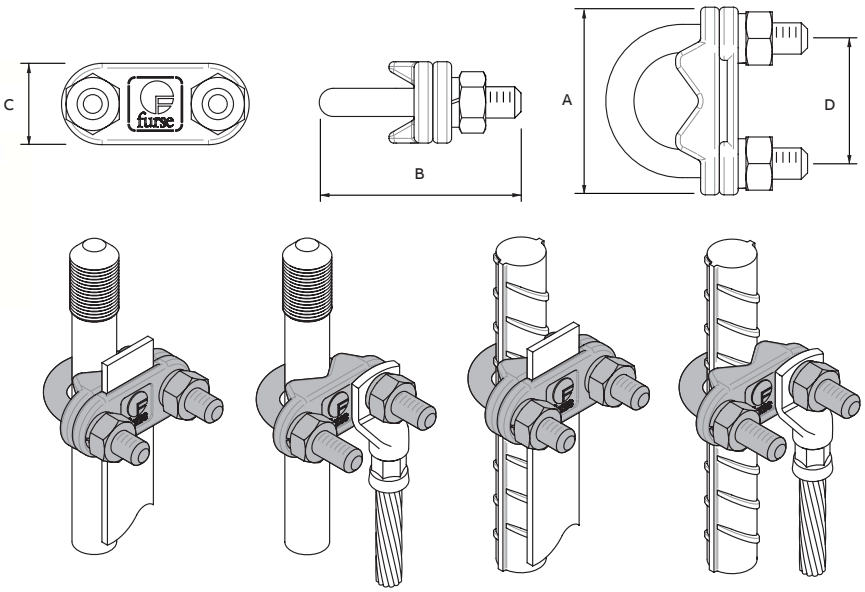
Certification / Standards: ● BS 7430 (clamps) / ● BS EN 62561-1 Class H / ● IEC/BS EN 50164-1 Class H.
High strength copper alloy clamp designed to provide a high quality, low resistance connection between solid circular or stranded conductor and an earth rod.
Tightening torque 12 Nm (CR5# part no.s).
*Suitable for use with Ø8 mm solid circular copper conductor.

Earth bonds & clamps

Mechanical clamps

'U' bolt rod clamp (type E)

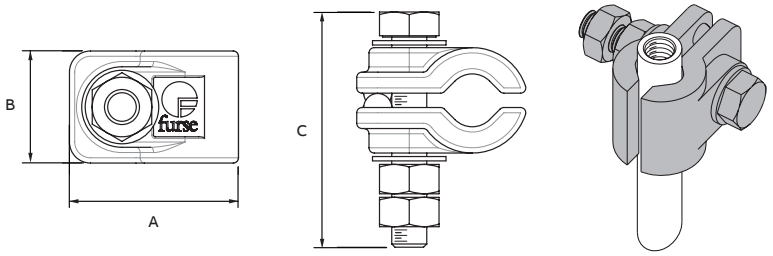
Part no.	ABB order code	'U' bolt material	Nominal rod/rebar diameter (mm)	Tape width (mm)	Dimensions (mm) A	B	C	D	Weight each (kg)	Certification/ standards
CR305	7TCA08321R0012	Copper	Ø14 - 25	–	60	65	26	40	0.18	● ● ●
CR320	7TCA08321R0015	Copper	Ø14 - 25	25	60	65	26	40	0.22	● ●
CR325	7TCA08321R0018	Stainless steel	Ø26 - 40	–	80	84	26	54	0.24	●
CR326	7TCA08321R0020	Stainless steel	Ø26 - 40	25	80	84	26	54	0.34	● ●
CR330	7TCA08321R0021	Copper	Ø41 - 50	–	90	90	26	64	0.44	●



Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H / ● UL 467.
CR320 & CR326 include additional plate to allow tape to be clamped without drilling.
'U' bolt threaded M10.

Rod to cable clamp (type B)

Part no.	ABB order code	Nominal rod diameter (")	(mm)	Rod type	Dimensions (mm) A	B	C	Bolt size	Weight each (kg)	Certification / standards
CR205	7TCA083220R0002	Ø⅜	Ø9.5	Copperbond	27	20	44	M8	0.09	●
CR215	7TCA083220R0003	Ø⅝	Ø16	Copperbond	48	32	67	M10	0.30	● ●
CR220	7TCA083220R0004	Ø⅝	Ø15	Solid copper	48	32	67	M10	0.30	●
CR225	7TCA083220R0005	Ø¾	Ø20	Copperbond	48	32	67	M10	0.30	●
CR230	7TCA083220R0006	Ø¾	Ø20	Solid copper	48	32	67	M10	0.30	● ●



Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H.
High strength copper alloy cable lug clamp designed to provide a high quality, low resistance connection between stranded conductor and earth rod.

Earth bonds & clamps

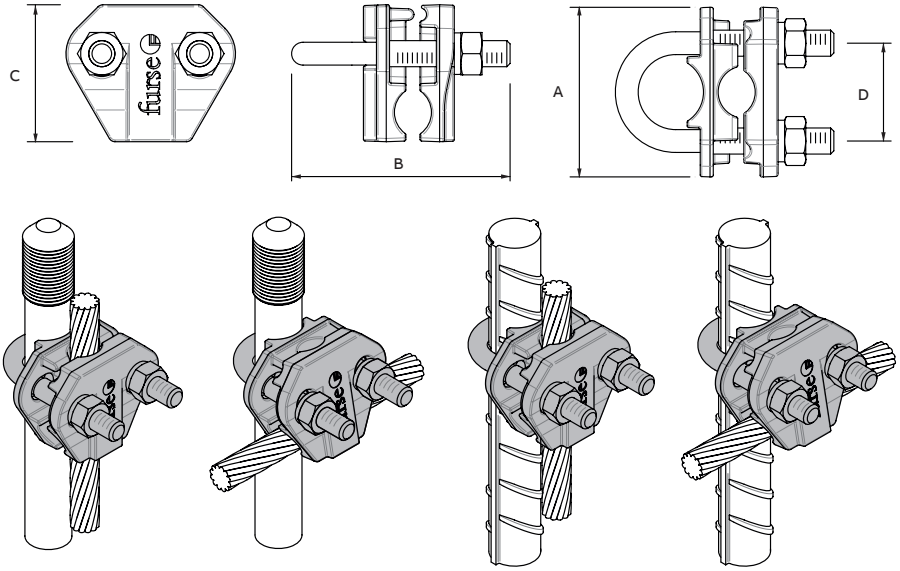
Mechanical clamps

'U' bolt rod clamp (type GUV)

Part no.	ABB order code	'U' bolt material	Nominal rod/rebar diameter (mm)	Conductor range (mm²)	Dimensions (mm) A	B	C	D	Weight each (kg)	Certification/ standards
CR700	7TCA083220R0015	Stainless steel	Ø12 - 20	16 - 70*	52	67	38	30	0.20	●●●
CR705	7TCA083220R0016	Stainless steel	Ø12 - 20	70 - 150	52	67	42	30	0.23	●●●
CR710	7TCA083220R0051	Copper	Ø25	16 - 70*	64	70	40	41	0.39	●
CR730	7TCA083220R0019	Stainless steel	Ø12 - 27	185 - 300	63	89	52	40	0.42	●●
CR740	7TCA083220R0052	Copper	Ø25	70 - 150	53	70	55	41	0.39	●
CR750	7TCA083220R0053	Copper	Ø25	150 - 300	64	90	55	41	0.39	●

CR705

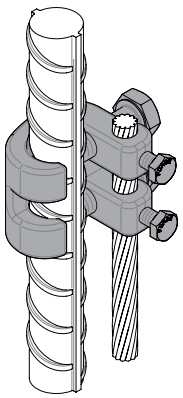
CR700



Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H / ● UL 467.
* Also suitable for diameter 8 mm solid circular copper conductor.
NOTE: The shape of some products may vary from those illustrated.

Rebar clamp

Part no.	ABB order code	Conductor size (mm)	Rebar diameter (mm)	Conductor material	Weight each (kg)	Certification / standards
BN150	7TCA083740R0000	Ø8	Ø8-18	Copper	0.32	●
BN155	7TCA083740R0001	Ø8	Ø18-38	Copper	0.75	●



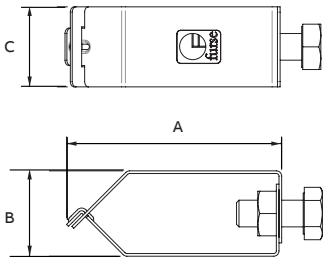
Certification / Standards: ● BS 7430.
High strength copper alloy rebar clamp for bonding to reinforcing bars, steam pipes, handrails etc.
Tightening torque 15 Nm (BN155 - M10); 5 Nm (BN155 - M6).

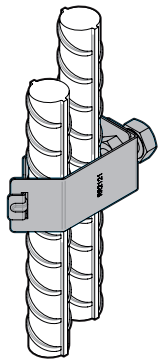
Earth bonds & clamps

Mechanical clamps

Rebar to rebar connecting clip

Part no.	ABB order code	Rebar diameter (A) (mm)	Rebar diameter (B) (mm)	Dimensions (mm) A	B	C	Weight each (kg)	Certification / standards
RR812	7TCA083740R0047	Ø8	Ø12	46	21	30	0.05	●
RR1616	7TCA083740R0040	Ø16	Ø16	60	21	30	0.05	● ●
RR2121	7TCA083740R0041	Ø20	Ø20	69	26	30	0.06	●
RR2626	7TCA083740R0042	Ø25	Ø25	81	32	30	0.07	●
RR3232	7TCA083740R0044	Ø32	Ø32	94	39	30	0.07	● ●
RR3838	7TCA083740R0046	Ø40	Ø40	112	46	30	0.08	● ●

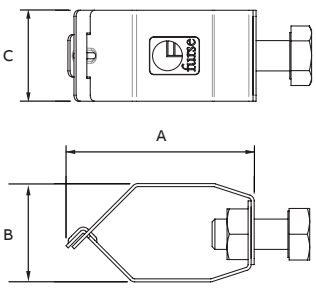


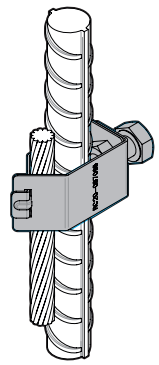


Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H / ● BS EN 50164-1 Class H.
Manufactured from high quality stainless steel for excellent corrosion resistance. Simple to install, providing a secure connection between internal reinforcing bars.
Tightening torque 12 Nm.

Rebar to conductor connecting clip

Part no.	ABB order code	Rebar diameter (mm)	Conductor size	Dimensions (mm) A	B	C	Weight each (kg)	Certification / standards
Rebar to flat tape								
RC25-087095	7TCA083830R0077	Ø25	25 x 3 mm	62	32	30	0.07	●
Rebar to stranded/solid circular conductor								
RC812-0850	7TCA083830R0080	Ø12	50 mm² or Ø8 mm	46	21	30	0.05	●
RC16-087095	7TCA083830R0075	Ø16	Ø8 mm, 50-70-95 mm²	50	21	30	0.06	●
RC20-087095	7TCA083830R0076	Ø20	Ø8 mm, 50-70-95 mm²	58	24	30	0.07	●
RC25-087095	7TCA083830R0077	Ø25	Ø8 mm, 50-70-95 mm²	62	32	30	0.07	●
RC32-087095	7TCA083830R0078	Ø32	Ø8 mm, 50-70-95 mm²	74	38	30	0.07	● ●
RC40-087095	7TCA083830R0079	Ø40	Ø8 mm, 50-70-95 mm²	76	45	30	0.08	●





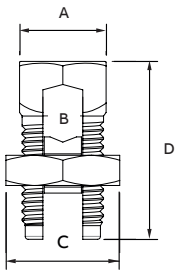
Certification / Standards: ● BS 7430 / ● BS EN 62561-1 Class H.
Manufactured from high quality stainless steel for excellent corrosion resistance. Simple to install, providing a secure connection between internal reinforcing. bars and flat tape, solid circular or stranded conductor.
Tightening torque 12 Nm.

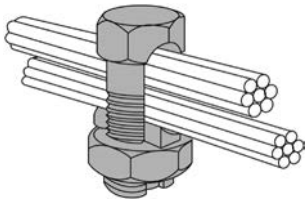
Earth bonds & clamps

Splitbolt connector

Type H high strength splitbolt connector

Part no.	ABB order code	Conductor range				Dimensions (mm)				Weight each (kg)	Cert. / standards
		Main min (mm²)	Main max (mm²)	Tap min (mm²)	Tap max (mm²)	A	B	C	D		
8H-FU	7TAH006100R0022	4	10	2.5	10	9.5	3.7	12.7	19.8	0.02	● ●
4H-FU	7TAH006100R0014	10	16	2.5	16	13.5	5.9	18.2	26.9	0.03	● ●
2H-FU	7TAH006100R0006	16	25	4	25	15.1	6.8	19.8	31.7	0.04	● ●
1H-FU	7TAH006100R0002	25	35	4	35	17.4	8.3	22.2	34.1	0.06	● ●
10H-FU	7TAH006100R0001	35	50	4	50	19	9.7	23.8	40.4	0.09	● ●
20H-FU	7TAH006100R0005	35	70	4	70	22.2	11.2	26.9	46	0.14	● ●
30H-FU	7TAH006100R0009	50	95	4	95	25.4	14.7	33.3	54.7	0.17	● ●
40H-FU	7TAH006100R0013	50	120	6	120	25.4	14.7	33.3	54.7	0.18	● ●
350M-FU	7TAH006100R0010	95	185	6	185	33.8	18.2	42	68.2	0.35	● ●





Certification / Standards: ● BS 7430 / ● UL 467.
Note: splitbolt connectors shown are from the ABB Blackburn® range of products.
For copper to copper connections. No special tools required.
Tinned copper splitbolt connectors available on request.

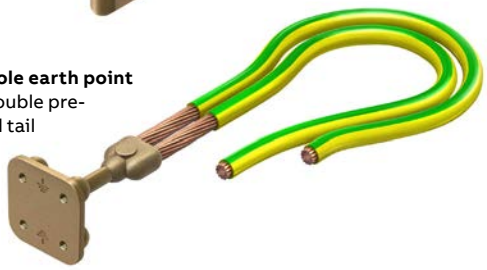
Earth points

High quality, cast-in, non-ferrous earth points, with a range of termination options

Furse earth points are installed to provide a connection point in reinforced steel concrete structures. When cast into the concrete they connect the steel reinforced bar to the lightning protection or earthing system.

Single hole earth point
with single pre-welded tail

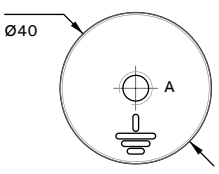
Two hole earth point
with single pre-welded tail

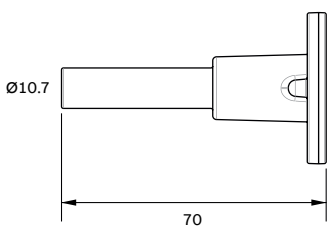


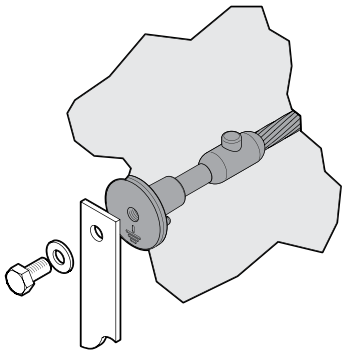
Four hole earth point
with double pre-welded tail

Single hole earth point

Part no.	ABB order code	Description	Hole size A (mm)	Weight each (kg)	Certification / standards
EP100	7TCA083730R0101	Single hole earth point with M8 hole	M8 x 15	0.11	● ●
EP101	7TCA083730R0102	Single hole earth point with M10 hole	M10 x 15	0.11	●
EP102	7TCA083730R0103	Single hole earth point with M12 hole	M12 x 15	0.11	●
Single hole earth point with single pre-welded tail					
EP105	7TCA083730R0111	EP100 earth point with pre-welded 500 mm earth cable	M8 x 15	0.45	● ●
EP106	7TCA083730R0115	EP101 earth point with pre-welded 500 mm earth cable	M10 x 15	0.45	●
EP107	7TCA083730R0112	EP102 earth point with pre-welded 500 mm earth cable	M12 x 15	0.45	●





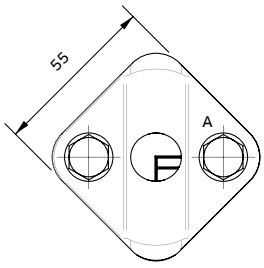


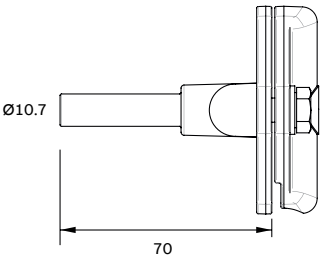
Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H.
Welded tails are 70mm² stranded copper cable.
Tightening torque 8 Nm.

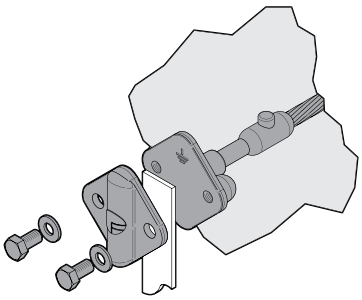
Earth points

Two hole earth point

Part no.	ABB order code	Description	Hole size A (mm)	Weight each (kg)	Certification / standards
EP115	7TCA083730R0105	Supplied c/w front plate for connection of 25 mm x 3 mm copper tape or 70 mm² stranded copper cable	M8 x 12	0.36	● ●
EP120	7TCA083730R0106	Supplied c/w front plate for connection of 25 mm x 3 mm copper tape or 8 mm Øsolid circular copper	M8 x 12	0.36	●
EP125	7TCA083730R0107	Supplied without front plate	M8 x 12	0.26	●
Two hole earth point with single pre-welded tail					
EP116	7TCA083730R0109	EP115 earth point with pre-welded 500 mm earth cable	M8 x 12	0.70	● ●
EP121	7TCA083730R0114	EP120 earth point with pre-welded 500 mm earth cable	M8 x 12	0.70	●
EP126	7TCA083730R0116	EP125 earth point with pre-welded 500 mm earth cable	M8 x 12	0.60	●
Two hole earth point with double pre-welded tail					
EP216	7TCA083730R0113	EP115 earth point with pre-welded 2 x 500 mm earth cable	M8 x 12	1.04	●
EP221	7TCA083730R0110	EP120 earth point with pre-welded 2 x 500 mm earth cable	M8 x 12	1.04	●



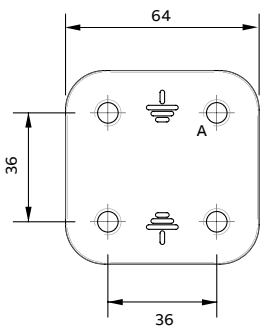


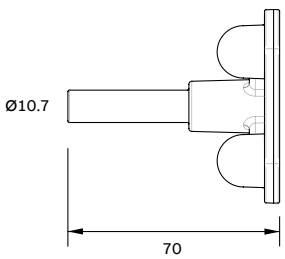


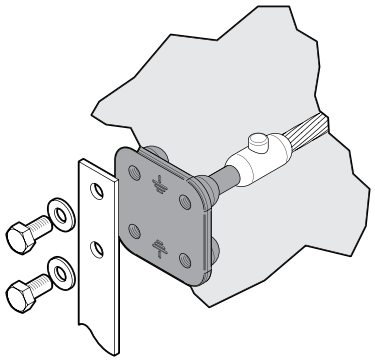
Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H.
Stem Ø= 10.7 mm (70 mm²).
Tightening torque 8 Nm.

Four hole earth point

Part no.	ABB order code	Description	Hole size A (mm)	Weight each (kg)	Certification / standards
EP110	7TCA083730R0104	Earth point only	M8 x 12	0.3	● ●
Four hole earth point with single pre-welded tail					
EP111	7TCA083730R0117	EP110 earth point with pre-welded 500 mm earth cable	M8 x 12	0.65	● ●
Four hole earth point with double pre-welded tail					
EP211	7TCA083730R0108	EP110 earth point with pre-welded 2 x 500 mm earth cable	M8 x 12	1.00	●





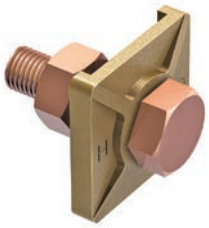


Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H.
Stem Ø= 10.7 mm (70 mm²).
Tightening torque 8 Nm.

Earth bonds & clamps

Bonds & clamps

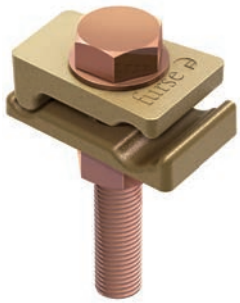
B bond



Part no.	ABB order code	Maximum tape width (mm)	Bolt size	Conductor material	Weight each (kg)	Certification / standards
BN105	7TCA083710R0000	26	M10	Copper	0.12	● ●
BN005	7TCA083720R0000	26	M10	Aluminium	0.06	● ●

Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H.
For bonding tape to steel structures.
Tightening torque 17 Nm.

Tower earth clamp



Part no.	ABB order code	Conductor range (mm²)	Channel thickness (mm)	Bolt size	Conductor material	Weight each (kg)	Cert. / standards
BN125*	7TCA083710R0005	16-70	10	M10	Copper	0.13	● ●
BN130	7TCA083710R0006	70-120	10	M12	Copper	0.22	● ●
BN305*	7TCA083740R0005	25-50	10	M10	Aluminium	0.05	● ●

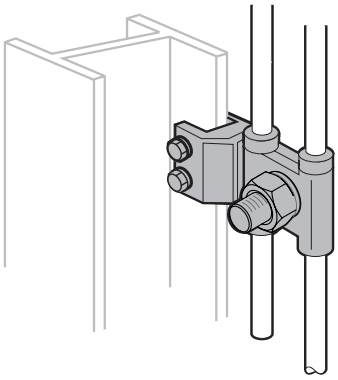
Certification / Standards: ● BS 7430 / ● BS EN 62561-1 Class H.
For bonding copper cable or wire to steel structures.
Tightening torque 12 Nm.
* Suitable for use with Ø8 mm solid circular conductor.

Earth bonds & clamps

Bonds & clamps

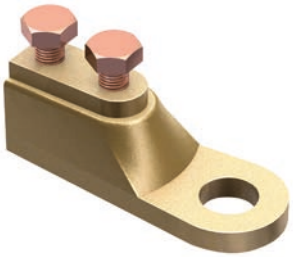
Metalwork bond

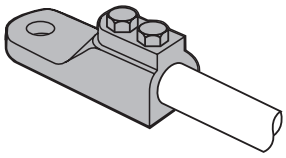
	Part no.	ABB order code	Conductor size (mm)	Conductor material	Weight each (kg)	Certification / standards
	CS350	7TCA083740R0007	Ø8	Copper	0.37	● ●
	CS355	7TCA083740R0008	Ø8	Aluminium	0.17	● ●



Certification / Standards: ● BS 7430 / ● IEC/BS EN 62561-1 Class H.
For connecting to all types of metal structures up to 13 mm thickness.
Tightening torque - M8 bolt: 10 Nm, M10 bolt: 12 Nm.

Straight setscrew cable socket

	Part no.	ABB order code	Conductor size (mm)	Palm hole diameter (mm)	Conductor material	Weight each (kg)	Certification / standards
	SX450	7TCA083740R0048	Ø8	12	Copper	0.11	●

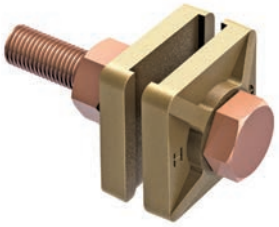


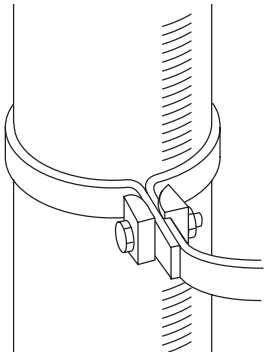
Certification / Standards: ● BS 7430 / ● BS EN 62561-1 Class H.
For bonding copper and aluminium conductors to steelwork.
Tightening torque 3 Nm.

Earth bonds & clamps

Bonds & clamps

RWP bond

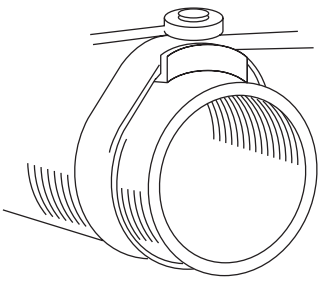
	Part no.	ABB order code	Maximum tape width (mm)	Bolt size	Conductor material	Weight each (kg)	Certification / standards
	BN115	7TCA083710R0003	26	M10	Copper	0.12	●
	BN010	7TCA083720R0002	26	M10	Aluminium	0.07	●



Certification / Standards: ● BS 7430.
For bonding tape to rainwater pipes, handrails etc.

Watermain bond

	Part no.	ABB order code	Maximum tape width (mm)	Conductor material	Weight each (kg)	Certification / standards
	BN120	7TCA083710R0004	26	Copper	0.26	●



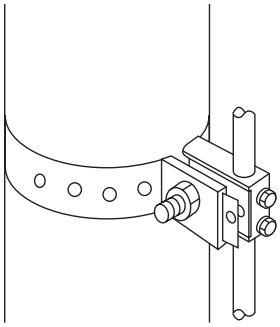
Certification / Standards: ● BS 7430.
For bonding tape to large diameter pipes.

Earth bonds & clamps

Pipe bonds & clamps

Pipe bond

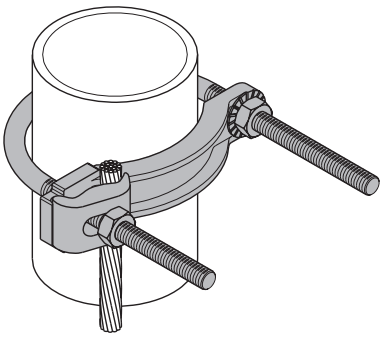
	Part no.	ABB order code	Conductor size (mm)	Pipe diameter (mm)	Conductor material	Weight each (kg)	Certification / standards
	BN175	7TCA083740R0002	Ø8	Ø50-200	Copper	0.46	● ●



Certification / Standards: ● BS 7430 / ● BS EN 62561-1 Class H.
For bonding to ducts and large diameter pipeworks. Additional lengths available to order.
Tightening torque - M6 bolt: 6 Nm, M10 bolt: 12 Nm.

Pipe clamp

	Part no.	ABB order code	Pipe diameter (")	Pipe diameter (mm)	Conductor range (mm²)	Weight each (kg)	Certification / standards
	3902-TB	7TAA014520R0000	Ø½-1	Ø13-25	25-95	0.3	● ●
	3903	7TAA014520R0003	Ø1¼-2	Ø32-50	25-95	0.4	● ●
	3904	7TAA014520R0005	Ø2½-3½	Ø65-90	25-95	0.5	● ●
	3905-TB	7TAA014520R0007	Ø4-5	Ø100-125	25-95	0.6	● ●
	3906-TB	7TAA014520R0009	Ø6	Ø150	25-95	0.8	● ●
	3907	7TAA014520R0011	Ø8	Ø200	25-95	1.0	● ●
	3908	7TAA014520R0013	Ø10	Ø250	25-95	1.1	● ●



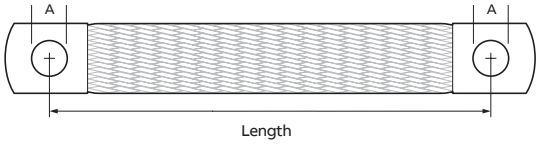
Certification / Standards: ● BS 7430 / ● UL 467.
Note: pipe clamps shown are part of the Blackburn® range of products.
Copper alloy clamp with zinc plated U-bolt.

Earth bonds & clamps

Flexible braid bonds

Flexible flat copper braid bond

Part no.	ABB order code	Overall braid dimensions (mm)	Length (mm)	Hole diameter (A) (mm)	Cross-sectional area (mm²)	Weight each (kg)	Certification / standards
Copper braid							
FBB-6-200-7	7TCA083070R0354	12 x 1	200	Ø7	6	0.01	● ●
FBB-16-200-9	7TCA083070R0389	19 x 2.5	200	Ø9	16	0.03	● ●
FBB-25-200-11	7TCA083070R0305	25 x 3	200	Ø11	25	0.05	● ●
BN505	7TCA083070R0012	25 x 3.5	200	Ø11	35	0.09	● ●
BN510	7TCA083070R0028	25 x 3.5	400	Ø11	35	0.15	● ●
FBB-50-200-11	7TCA083070R0088	30 x 5	200	Ø11	50	0.10	● ●
FBB-70-200-13	7TCA083070R0304	32 x 6	200	Ø13	70	0.13	● ●
FBB-95-200-13	7TCA083070R0290	37 x 6	200	Ø13	95	0.19	● ●
FBB-120-200-17	7TCA083070R0319	45 x 6	200	Ø17	120	0.23	● ●
Tinned copper braid							
FBB-6-200-7-T	7TCA083070R0361	12 x 1	200	Ø7	6	0.01	● ●
FBB-16-200-9-T	7TCA083070R0377	19 x 2.5	200	Ø9	16	0.03	● ●
FBB-25-200-11-T	7TCA083070R0321	25 x 3	200	Ø11	25	0.05	● ●
BN505-T	7TCA083070R0027	25 x 3.5	200	Ø11	35	0.09	● ●
BN510-T	7TCA083070R0030	25 x 3.5	400	Ø11	35	0.15	● ●
FBB-50-200-11-T	7TCA083070R0355	30 x 5	200	Ø11	50	0.10	● ●
FBB-70-200-13-T	7TCA083070R0365	32 x 6	200	Ø13	70	0.13	● ●
FBB-95-200-13-T	7TCA083070R0291	37 x 6	200	Ø13	95	0.19	● ●
FBB-120-200-17-T	7TCA083070R0417	45 x 6	200	Ø17	120	0.23	● ●



Certification / Standards: ● BS EN 13602 / ● BS 7430.
Flexible copper or flexible tinned copper braid terminated with pressed ferrule connector at each end, suitable for bonding gates, doors, fences etc. Pressed ferrule connection ensures maximum electrical contact with minimum earth resistance
Standard braid sizes are shown. Braids are available in other sizes, lengths, materials or terminations to special order. Circular braids are available to special order. Please contact us for details

Earth bonds & clamps

Earth bosses

Earth boss

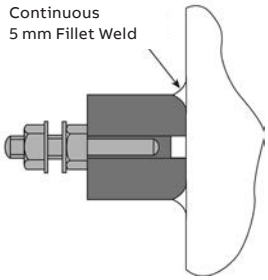
EB0221

EB0221-SS

EB1221

EB1221-SS

Part no.	ABB order code	Length (mm)	Dia. (mm)	Thread size	Boss Material	Fixings Material	Weight each (kg)	Cert. / standards
EB0111	7TCA083870R0087	30	Ø30	M10	Mild steel	Phosphor bronze	0.20	●
EB0111-SS	7TCA083870R1726	30	Ø30	M10	Mild steel	Stainless steel	0.20	●
EB1111	7TCA083870R0089	30	Ø30	M10	Stainless steel	Phosphor bronze	0.20	●
EB1111-SS	7TCA083870R1627	30	Ø30	M10	Stainless steel	Stainless steel	0.20	●
EB0121	7TCA083870R1256	30	Ø40	M10	Mild steel	Phosphor bronze	0.26	●
EB0121-SS	7TCA083870R1544	30	Ø40	M10	Mild steel	Stainless steel	0.26	●
EB1121	7TCA083870R1264	30	Ø40	M10	Stainless steel	Phosphor bronze	0.26	●
EB1121-SS	7TCA083870R1616	30	Ø40	M10	Stainless steel	Stainless steel	0.26	●
EB0221	7TCA083870R1263	40	Ø40	M10	Mild steel	Phosphor bronze	0.43	●
EB0221-SS	7TCA083870R1727	40	Ø40	M10	Mild steel	Stainless steel	0.43	●
EB1221	7TCA083870R1307	40	Ø40	M10	Stainless steel	Phosphor bronze	0.43	●
EB1221-SS	7TCA083870R1729	40	Ø40	M10	Stainless steel	Stainless steel	0.43	●
EB0321	7TCA083870R1440	50	Ø40	M10	Mild steel	Phosphor bronze	0.65	●
EB0321-SS	7TCA083870R1728	50	Ø40	M10	Mild steel	Stainless steel	0.65	●
EB1321	7TCA083870R1311	50	Ø40	M10	Stainless steel	Phosphor bronze	0.65	●
EB1321-SS	7TCA083870R1725	50	Ø40	M10	Stainless steel	Stainless steel	0.65	●
EB001	7TCA083870R0087	50	Ø50	M10	Mild steel	Phosphor bronze	0.80	●
EB001-SS	7TCA083870R1601	50	Ø50	M10	Mild steel	Stainless steel	0.80	●
EB1331	7TCA083870R0091	50	Ø50	M10	Stainless steel	Phosphor bronze	0.80	●
EB1331-SS	7TCA083870R1524	50	Ø50	M10	Stainless steel	Stainless steel	0.80	●



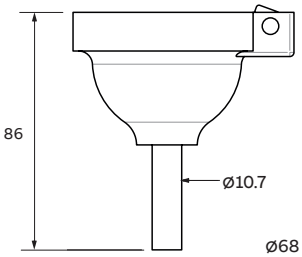
Certification / Standards: ● BS 7430.
Earth boss manufactured from mild steel (to 970 230M07 grade EN1A) or stainless steel (grade 316L) complete with phosphor bronze or stainless steel.
grade 316 studs, nuts and washers (suffix –SS part numbers). For welding to steel vessels, tanks, structures etc.
Wrap connections with moisture inhibiting tape.
Other sizes/types available on request.

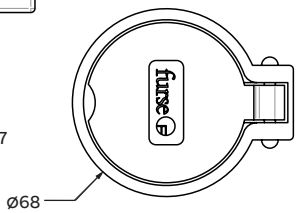
Earth bonds & clamps

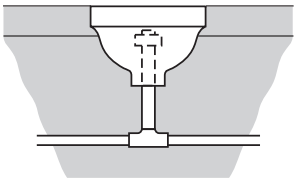
Static earth connection points

Static earth receptacle

	Part no.	ABB order code	Conductor material	Weight each (kg)	Certification / standards
	RX005	7TCA083750R0012	Copper	0.64	●







Certification / Standards: ● BS 7430.
For setting into roadways or runways. Provides a static discharge point for aircraft, fuel tankers, etc.

Earth bonds & clamps

Static earth clamps

Stainless steel earthing clamp

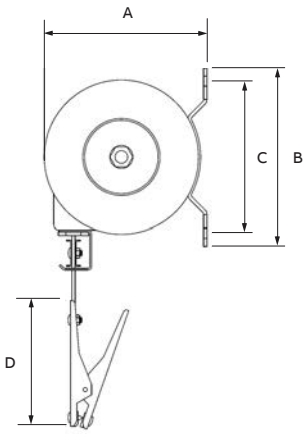
Part no.	ABB order code	Description	Jaw opening (mm)	Cable length (max) (m)	Weight each (kg)	Certification / standards
SK010	7TCA083750R0016	Medium duty earthing clamp	15	3	0.56	●
SK020	7TCA083750R0017	Heavy duty earthing clamp	35	5	1.09	● ●

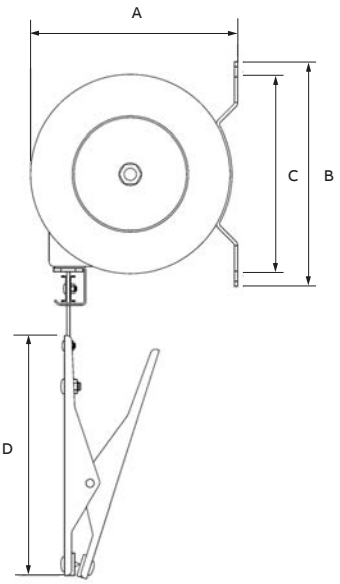
Certification / Standards: ● Ex ii 1 GD T6 (clamp) / ● FM Approved (heavy duty earthing clamp).
Medium duty stainless earthing clamp for earthing buckets, small drums, containers and plant equipment etc.
Heavy duty stainless earthing clamp for earthing 205 litre drums, IBCs, production vessels and road tankers etc.
Clamp features twin tungsten carbide teeth for effective penetration of paint and contamination.
Supplied complete with chemically resistant Cen-Stat Spiral Cable and 10 mm ring terminal.

Static discharge reels

Part no.	ABB order code	Dimensions (mm) A	B	C	D	Cable length (m)	Clamp jaw opening (mm)	Weight (kg)	Certification / standards
SK030 (medium duty)	SK030	7TCA083750R0018	155	170	145	120	6.1	0 - 12	3	● ●
	SK040	7TCA083750R0019	200	220	200	235	15.2	0 - 46	6	● ● ●

SK040
(heavy duty)





Certification / Standards: ● Ex ii 1 GD T6 (clamp) / ● Ex ii 2 GD T6 (reel) / ● FM Approved (heavy duty earthing clamp).
Medium duty stainless earthing clamp for earthing buckets, small drums, containers and plant equipment etc.
Heavy duty stainless earthing clamp for earthing 205 litre drums, IBC's, production vessels and road tankers.
Clamp features twin tungsten carbide teeth for effective penetration of paint and contamination.
Supplied complete with retracting cable reel.

Earth bonds & clamps
Earth bars

— 01 Copper earth bars.
— 02 Tinned copper earth bar.
— 03 Copper earth bar with SS fixings.

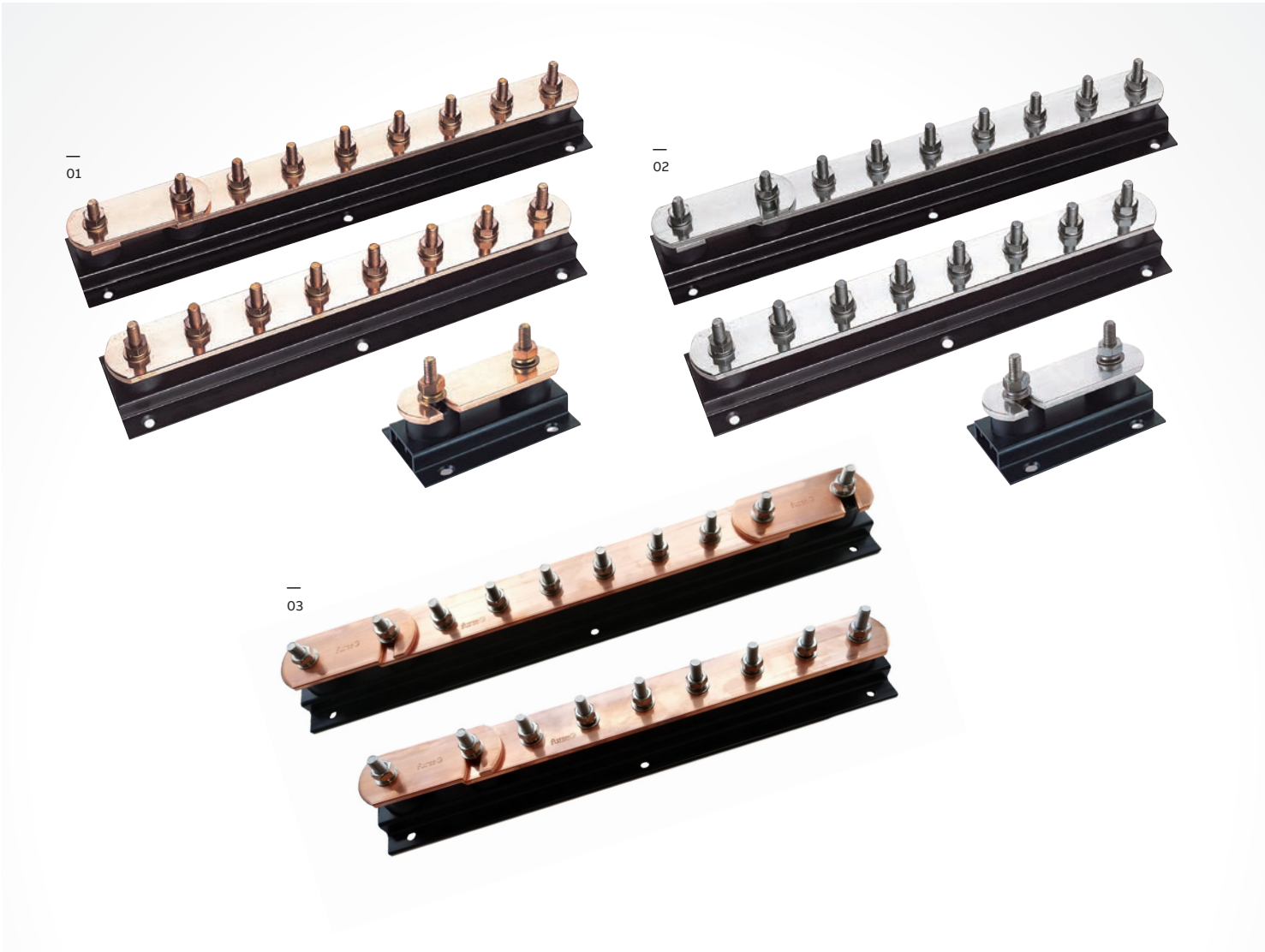
Furse earth bars are an efficient and convenient way of providing a common earth point, and integral disconnecting links allow easy isolation for testing purposes.

Standard Furse earth bars are available in a variety of lengths, but all consist of a 50 mm wide by 6 mm thick copper bar with M10 termination screws - standard product codes are provided.

Standard features and benefits
- The plastic channel base is entirely corrosion proof, made from high impact uPVC unlike the traditional galvanized steel channel
- The use of a modern polymer channel has reduced the weight of the products, making them easier to handle
- Pre-drilled fixing holes for ease of installation
- A range of three designs to meet most installation requirements
- Swan-Neck accessory, to facilitate the main earth bar connection
- Available as bare copper or tinned copper hard drawn bar

Special earth bar requirements
Standard earth bars meet the majority of applications, however where a customer has a specific requirement, we can design and manufacture special earth bars and disconnecting links as appropriate. Special earth bar designs are provided for customer review and approval as required before manufacture.

Special earth bar design variables include:
- Length, width and thickness of earth bar
- Size and type of bolt, hex nut and washer
- Number of disconnecting links, and their position
- Number of insulators
- Supplied with mounting base or without



Earth bonds & clamps

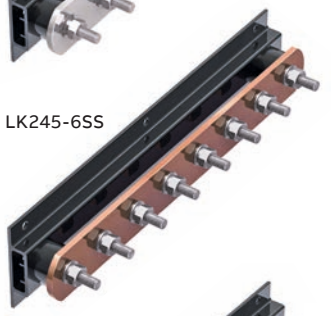
Earth bars

Earth bar

LK245-6

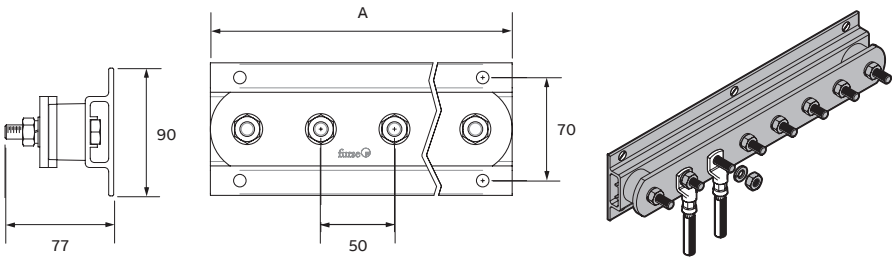
LK245-6T

LK245-6SS



LK245-6TSS

Part no.	ABB order code	Description	Dimension A / Length (mm)	Weight each (kg)	Certification / standards
Copper earth bar					
LK245-6	7TCA083670R0739	6 way	400	1.80	● ●
LK245-8	7TCA083670R0745	8 way	500	2.20	● ●
LK245-10	7TCA083670R0685	10 way	650	2.80	● ●
LK245-12	7TCA083670R0690	12 way	750	3.20	● ●
LK245-14	7TCA083670R0693	14 way	850	3.60	● ●
LK245-16	7TCA083670R0697	16 way	950	4.00	● ●
LK245-18	7TCA083670R0700	18 way	1,050	4.40	● ●
LK245-20	7TCA083670R0703	20 way	1,200	5.00	● ●
LK245-22	7TCA083670R0706	22 way	1,300	5.40	● ●
LK245-24	7TCA083670R0709	24 way	1,400	5.80	● ●
LK245-26	7TCA083670R0712	26 way	1,500	6.20	● ●
LK245-28	7TCA083670R0714	28 way	1,650	6.90	● ●
LK245-30	7TCA083670R0718	30 way	1,750	7.30	● ●
Tinned copper earth bar					
LK245-6T	7TCA083670R0741	6 way	400	1.80	●
LK245-8T	7TCA083670R0750	8 way	500	2.20	●
LK245-10T	7TCA083670R0686	10 way	650	2.80	●
LK245-12T	7TCA083670R0691	12 way	750	3.20	●
LK245-14T	7TCA083670R0694	14 way	850	3.60	●
LK245-16T	7TCA083670R0698	16 way	950	4.00	●
LK245-18T	7TCA083670R0701	18 way	1,050	4.40	●
LK245-20T	7TCA083670R0705	20 way	1,200	5.00	●
LK245-22T	7TCA083670R0707	22 way	1,300	5.40	●
LK245-24T	7TCA083670R0710	24 way	1,400	5.80	●
LK245-26T	7TCA083670R0713	26 way	1,500	6.20	●
LK245-28T	7TCA083670R0715	28 way	1,650	6.90	●
LK245-30T	7TCA083670R0719	30 way	1,750	7.30	●
Copper earth bar with stainless steel fixings					
LK245-6SS	7TCA083670R1257	6 way	400	1.80	●
LK245-8SS	7TCA083670R1264	8 way	500	2.20	●
LK245-10SS	7TCA083670R1260	10 way	650	2.80	●
LK245-12SS	7TCA083670R1256	12 way	750	3.20	●
Tinned copper earth bar with stainless steel fixings					
LK245-6TSS	7TCA083670R1279	6 way	400	1.80	●
LK245-8TSS	7TCA083670R1278	8 way	500	2.20	●
LK245-10TSS	7TCA083670R1277	10 way	650	2.80	●
LK245-12TSS	7TCA083670R1276	12 way	750	3.20	●



Certification / Standards: ● BS 7430 / ● IEC 62561-1 Class N.
Fix using countersunk wood screws 1½" No. 12 (Part no. SW110) and wall plugs (Part no. PS310).
Tightening torque 20 Nm.

Earth bonds & clamps

Earth bars

Earth bar with single disconnecting link

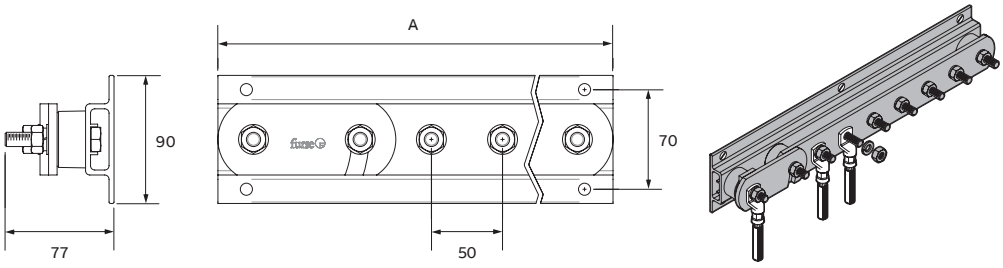
LK243-6

LK243-6-T

LK243-6SS

LK243-6TSS

Part no.	ABB order code	Description	Dimension A / Length (mm)	Weight each (kg)	Certification / standards
Copper earth bar					
LK243-6	7TCA083670R0676	6 way	475	2.30	●
LK243-8	7TCA083670R0679	8 way	575	2.70	●
LK243-10	7TCA083670R0647	10 way	725	3.30	●
LK243-12	7TCA083670R0650	12 way	825	3.70	●
LK243-14	7TCA083670R0653	14 way	925	4.10	●
LK243-16	7TCA083670R0656	16 way	1,025	4.50	●
LK243-18	7TCA083670R0658	18 way	1,125	4.90	●
LK243-20	7TCA083670R0661	20 way	1,275	5.50	●
LK243-22	7TCA083670R0663	22 way	1,375	5.90	●
LK243-24	7TCA083670R0664	24 way	1,475	6.30	●
LK243-26	7TCA083670R0666	26 way	1,575	6.70	●
LK243-28	7TCA083670R0667	28 way	1,725	7.40	●
LK243-30	7TCA083670R0669	30 way	1,825	7.80	●
Tinned copper earth bar					
LK243-6T	7TCA083670R0677	6 way	475	2.30	●
LK243-8T	7TCA083670R0680	8 way	575	2.70	●
LK243-10T	7TCA083670R0648	10 way	725	3.30	●
LK243-12T	7TCA083670R0651	12 way	825	3.70	●
LK243-14T	7TCA083670R0836	14 way	925	4.10	●
LK243-16T	7TCA083670R0657	16 way	1,025	4.50	●
LK243-18T	7TCA083670R0659	18 way	1,125	4.90	●
LK243-20T	7TCA083670R0662	20 way	1,275	5.50	●
LK243-22T	7TCA083870R1730	22 way	1,375	5.90	●
LK243-24T	7TCA083670R0665	24 way	1,475	6.30	●
LK243-26T	7TCA083670R1069	26 way	1,575	6.70	●
LK243-28T	7TCA083670R0971	28 way	1,725	7.40	●
LK243-30T	7TCA083670R1067	30 way	1,825	7.80	●
Copper earth bar with stainless steel fixings					
LK243-6SS	7TCA083670R1254	6 way	475	2.30	●
LK243-8SS	7TCA083670R1262	8 way	575	2.70	●
LK243-10SS	7TCA083670R1258	10 way	725	3.30	●
LK243-12SS	7TCA083670R1255	12 way	825	3.70	●
Tinned copper earth bar with stainless steel fixings					
LK243-6TSS	7TCA083670R1275	6 way	475	2.30	●
LK243-8TSS	7TCA083670R1274	8 way	575	2.70	●
LK243-10TSS	7TCA083670R1273	10 way	725	3.30	●
LK243-12TSS	7TCA083670R1272	12 way	825	3.70	●



Certification / Standards: ● BS 7430.
Fix using countersunk wood screws 1½" No. 12 (Part no. SW110) and wall plugs (Part no. PS310).
Tightening torque 20 Nm.

Earth bonds & clamps

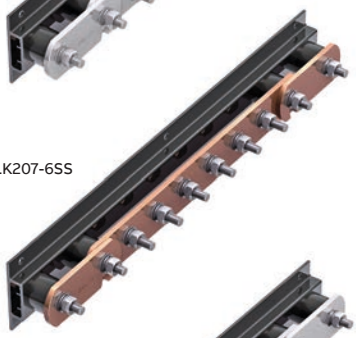
Earth bars

Earth bar with twin disconnecting links

LK207-6

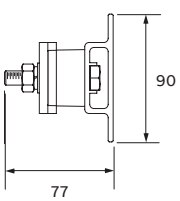
LK207-6-T

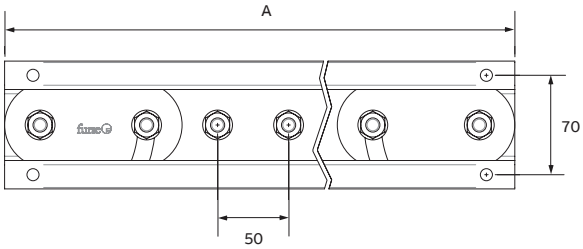
LK207-6SS

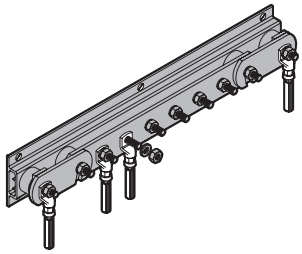


LK207-6TSS

Part no.	ABB order code	Description	Dimension A / Length (mm)	Weight each (kg)	Certification / standards
Copper earth bar					
LK207-6	7TCA083670R0632	6 way	550	2.80	●
LK207-8	7TCA083670R0634	8 way	650	3.20	●
LK207-10	7TCA083670R0603	10 way	800	3.80	●
LK207-12	7TCA083670R0605	12 way	900	4.20	●
LK207-14	7TCA083670R0607	14 way	1,000	4.60	●
LK207-16	7TCA083670R0611	16 way	1,100	5.00	●
LK207-18	7TCA083670R0613	18 way	1,200	5.40	●
LK207-20	7TCA083670R0615	20 way	1,350	6.00	●
LK207-22	7TCA083670R0618	22 way	1,450	6.40	●
LK207-24	7TCA083670R0620	24 way	1,550	6.80	●
LK207-26	7TCA083670R0623	26 way	1,650	7.20	●
LK207-28	7TCA083670R0625	28 way	1,800	7.90	●
LK207-30	7TCA083670R0627	30 way	1,900	8.30	●
Tinned copper earth bar					
LK207-6T	7TCA083670R0633	6 way	550	2.80	●
LK207-8T	7TCA083670R0635	8 way	650	3.20	●
LK207-10T	7TCA083670R0604	10 way	800	3.80	●
LK207-12T	7TCA083670R0606	12 way	900	4.20	●
LK207-14T	7TCA083670R0608	14 way	1,000	4.60	●
LK207-16T	7TCA083670R0612	16 way	1,100	5.00	●
LK207-18T	7TCA083670R0614	18 way	1,200	5.40	●
LK207-20T	7TCA083670R0616	20 way	1,350	6.00	●
LK207-22T	7TCA083670R0619	22 way	1,450	6.40	●
LK207-24T	7TCA083670R0621	24 way	1,550	6.80	●
LK207-26T	7TCA083670R0624	26 way	1,650	7.20	●
LK207-28T	7TCA083670R0994	28 way	1,800	7.90	●
LK207-30T	7TCA083670R0628	30 way	1,900	8.30	●
Copper earth bar with stainless steel fixings					
LK207-6SS	7TCA083670R1263	6 way	550	2.80	●
LK207-8SS	7TCA083670R1265	8 way	650	3.20	●
LK207-10SS	7TCA083670R1259	10 way	800	3.80	●
LK207-12SS	7TCA083670R1261	12 way	900	4.20	●
Tinned copper earth bar with stainless steel fixings					
LK207-6TSS	7TCA083670R1271	6 way	550	2.80	●
LK207-8TSS	7TCA083670R1270	8 way	650	3.20	●
LK207-10TSS	7TCA083670R1269	10 way	800	3.80	●
LK207-12TSS	7TCA083670R1268	12 way	900	4.20	●





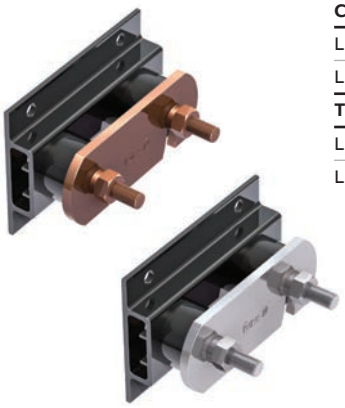


Certification / Standards: ● BS 7430.
Fix using countersunk wood screws 1½" No. 12 (Part no. SW110) and wall plugs (Part no. PS310).
Tightening torque 20 Nm.

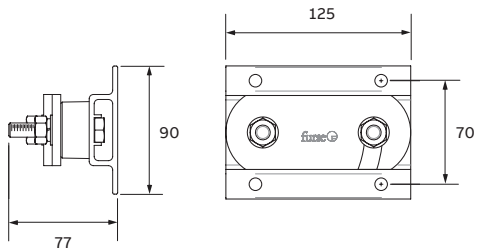
Earth bonds & clamps

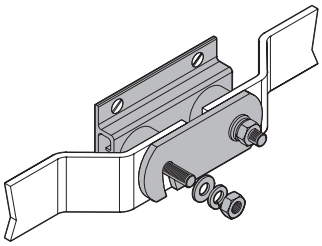
Accessories

Earth bar links



Part no.	ABB order code	Description	Length (mm)	Width (mm)	Height (mm)	Weight each (kg)	Certification / standards
Copper link							
LK004	7TCA083670R0599	Swan-neck link	150	50	36	0.42	●
LK205	7TCA083670R0600	Disconnecting link	125	90	77	0.59	●
Tinned copper link							
LK004T	7TCA083670R0925	Swan-neck link	150	50	36	0.42	●
LK205T	7TCA083670R0601	Disconnecting link	125	90	77	0.59	●

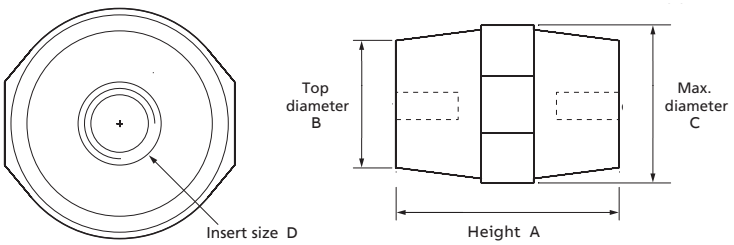




Certification / Standards: ● BS 7430.
Disconnecting link: fix using countersunk wood screws 1½" No. 12 (Part no. SW110) and wall plugs (Part no. PS310).
Tightening torque 20 Nm.

Insulator

Part no.	ABB order code	Height (A) (mm)	Top diameter (B) (mm)	Max diameter (C) (mm)	Insert size (D)	For copper bar size (mm)
Insulator						
IN020	7TCA083340R0008	20	Ø14	Ø18	M6	25 x 3
IN030	7TCA083340R0009	30	Ø25	Ø33	M6	25 x 6
IN040	7TCA083340R0010	40	Ø31	Ø39	M8	38 x 6
IN013	7TCA083340R0007	50	Ø27	Ø35	M10	50 x 6
IN060	7TCA083340R0011	60	Ø38	Ø52	M10	75 x 6
IN070	7TCA083340R0012	70	Ø51	Ø55	M12	100 x 6
Insulator with 2 studs and 3 nuts						
IN005	7TCA083340R0006	50	Ø27	Ø35	M10	50 x 6



Insulator manufactured from grey GRP material with brass insert.

Earth bonds & clamps

Compression connectors

Copper ‘C’ shape connector

Part no.	ABB order code	Conductor range (main) (mm²)	Conductor range (tap) (mm²)	Weight each (kg)
CN1010	7TCA083870R0039	10	4-10	0.01
CN1616	7TCA083870R0045	16	4-16	0.02
CN2510	7TCA083870R0050	16-25	1.5-10	0.02
CN2525	7TCA083870R0051	25	6-25	0.04
CN3516	7TCA083870R0052	35	1.5-16	0.04
CN3535	7TCA083870R0053	35	16-35	0.04
CN5050	7TCA083870R0056	50	16-50	0.04
CN7035	7TCA083870R0059	50-70	4-35	0.10
CN7070	7TCA083870R0061	50-70	35-70	0.10
CN9535	7TCA083870R0063	95	4-35	0.15
CN9570	7TCA083870R0064	95	35-70	0.16
CN9595	7TCA083870R0065	95	95	0.15
CN120120	7TCA083870R0040	120	35-120	0.17
CN150150	7TCA083870R0044	150	70-150	0.12
CN18595	7TCA083870R0047	185	95	0.13
CN185185	7TCA083870R0046	120-185	95-185	0.25
CN240120	7TCA083870R0048	150-240	95-120	0.24
CN240240	7TCA083870R1278	150-240	150-240	0.22

Manufactured from pure copper.
Ensure all underground connections are sealed/waterproofed using moisture inhibiting tape.
Additional sizes available on request.

Earth bonds & clamps

Compression connectors

Tinned copper 'C' shape connector

Part no.	ABB order code	Conductor range (main) (mm²)	Conductor range (tap) (mm²)	Weight each (kg)
CN1010-T	7TCA083870R1532	10	4-10	0.01
CN1616-T	7TCA083870R1318	16	4-16	0.02
CN2510-T	7TCA083870R1737	16-25	1.5-10	0.02
CN2525-T	7TCA083670R0967	25	6-25	0.04
CN3516-T	7TCA083870R1536	35	1.5-16	0.04
CN3535-T	7TCA083670R0007	35	16-35	0.04
CN5050-T	7TCA083870R1736	50	16-50	0.04
CN7035-T	7TCA083870R0060	50-70	4-35	0.10
CN7070-T	7TCA083870R0062	50-70	35-70	0.10
CN9535-T	7TCA083870R1265	95	4-35	0.15
CN9570-T	7TCA083870R1735	95	35-70	0.16
CN9595-T	7TCA083870R1266	95	95	0.15
CN120120-T	7TCA083870R1434	120	35-120	0.17
CN150150-T	7TCA083870R1738	150	70-150	0.12
CN18595-T	7TCA083870R1454	185	95	0.13
CN185185-T	7TCA083870R1734	120-185	95-185	0.25
CN240120-T	7TCA083870R1452	150-240	95-120	0.24
CN240240-T	7TCA083870R1523	240	150-240	0.22

Manufactured from electroplated tinned pure copper.
Ensure all underground connections are sealed/waterproofed using moisture inhibiting tape.
Additional sizes available on request.

Technical reference
Introduction

The IEC/BS EN 62305 standard reflects increased scientific understanding of lightning and its effects over the last twenty years, and takes stock of the growing impact of technology and electronic systems on our daily activities.

IEC/BS EN 62305 Lightning protection standard
The IEC/BS EN 62305 Standard for lightning protection was originally published in September 2006, to supercede the previous standard, BS 6651:1999.

For a period, IEC/BS EN 62305 and BS 6651 ran in parallel, but in August 2008, BS 6651 was withdrawn and now IEC/BS EN 63205 is the recognised standard for lightning protection.

More complex and exacting than its predecessor, IEC/BS EN 62305 includes four distinct parts - general principles, risk management, physical damage to structures and life hazard, and electronic systems protection.

Key to IEC/BS EN 62305 is that all considerations for lightning protection are driven by a complex and comprehensive risk assessment and that this assessment not only takes into account the structure to be protected, but also the services to which the structure is connected. In essence, structural lightning protection can no longer be considered in isolation, protection against transient overvoltages or electrical surges is integral to IEC/BS EN 62305.

Structure of IEC/BS EN 62305
The IEC/BS EN 62305 series consists of four parts, all of which need to be taken into consideration. These four parts are outlined here.

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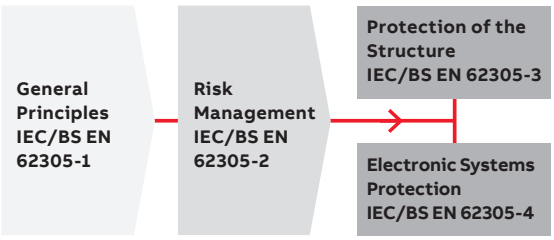
Structure of IEC/BS EN 62305.



Part 1: General principles
IEC/BS EN 62305-1 (part 1) is an introduction to the other parts of the standard and essentially describes how to design a Lightning Protection System (LPS) in accordance with the accompanying parts of the standard.

Part 2: Risk management
IEC/BS EN 62305-2 (part 2) risk management approach, does not concentrate so much on the purely physical damage to a structure caused by a lightning discharge, but more on the risk of loss of human life (including permanent injury), loss of service to the public, loss of cultural heritage and economic loss.

Part 3: Physical damage to structures and life hazard
IEC/BS EN 62305-3 (part 3) relates directly to the major part of BS 6651. It differs from BS 6651 in as much that this new part has four Classes or protection levels of LPS, as opposed to the basic two (ordinary and high-risk) levels in BS 6651.

Part 4: Electrical and electronic systems within structures
IEC/BS EN 62305-4 (part 4) covers the protection of electrical and electronic systems housed within structures. It embodies what Annex C in BS 6651 conveyed, but with a new zonal approach referred to as Lightning Protection Zones (LPZs). It provides information for the design, installation, maintenance and testing of a Lightning Electromagnetic Impulse (LEMP) protection system (now referred to as Surge Protection Measures - SPM) for electrical/ electronic systems within a structure.

Technical reference
IEC/BS EN 62305-1 - General principles

This opening part of the IEC/BS EN 62305 suite of standards serves as an introduction to the further parts of the standard. It classifies the sources and types of damage to be evaluated and introduces the risks or types of loss to be anticipated as a result of lightning activity.

Furthermore, it defines the relationships between damage and loss that form the basis for the risk assessment calculations in part 2 of the standard.

Lightning current parameters are defined. These are used as the basis for the selection and implementation of the appropriate protection measures detailed in parts 3 and 4 of the standard.

Part 1 of the standard also introduces new concepts for consideration when preparing a lightning protection system, such as Lightning Protection Zones (LPZs) and separation distance.

Damage and loss
IEC/BS EN 62305 identifies four main sources of damage:
- **S1** Flashes to the structure
- **S2** Flashes near to the structure
- **S3** Flashes to the lines connected to the structure
- **S4** Flashes near the lines connected to the structure

Each source of damage may result in one or more of three types of damage:
- **D1** Injury of living beings by electric shock
- **D2** Physical damage (fire, explosion, mechanical destruction, chemical release) due to lightning current effects including sparking
- **D3** Failure of internal systems due to Lightning
- Electromagnetic Impulse (LEMP)

The following types of loss may result from damage due to lightning:
- **L1** Loss of human life (including permanent injury)
- **L2** Loss of service to the public
- **L3** Loss of cultural heritage
- **L4** Loss of economic value (structure, its content, and loss of activity)

The relationships of all of the above parameters are summarized in Table 1.

System design criteria
The ideal lightning protection for a structure and its connected services would be to enclose the structure within an earthed and perfectly conducting metallic shield (box), and in addition provide adequate bonding of any connected services at the entrance point into the shield.

This in essence would prevent the penetration of the lightning current and the induced electromagnetic field into the structure. However, in practice it is not possible or indeed cost effective to go to such lengths.

This standard thus sets out a defined set of lightning current parameters where protection measures, adopted in accordance with its recommendations, will reduce any damage and consequential loss as a result of a lightning strike. This reduction in damage and consequential loss is valid provided the lightning strike parameters fall within defined limits, established as Lightning Protection Levels (LPL).

Table 1: Damage and loss in a structure according to point of lightning strike (IEC/BS EN 62305-1 Table 2)

Point of strike	Source of damage	Type of damage	Type of loss
Structure	S1	D1	L1, L4**
		D2	L1, L2, L3, L4
		D3	L1*, L2, L4
Near a Structure	S2	D3	L1*, L2, L4
Lines connected to the structure	S3	D1	L1, L4**
		D2	L1, L2, L3, L4
		D3	L1*, L2, L4
Near a Line	S4	D3	L1*, L2, L4

*Only for structures with risk of explosion and for hospitals or other structures where failures of internal systems immediately endangers human life
**Only for properties where animals may be lost

Technical reference

IEC/BS EN 62305-1 - Lightning protection levels (LPL)

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01 The types of damage and loss resulting from a lightning strike on or near a structure

Lightning Protection Levels (LPL)
Four protection levels have been determined based on parameters obtained from previously published technical papers. Each level has a fixed set of maximum and minimum lightning current parameters. These parameters are shown in Table 2.

The maximum values have been used in the design of products such as lightning protection components and Surge Protective Devices (SPDs).

The minimum values of lightning current have been used to derive the rolling sphere radius for each level.

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Table 2: Lightning current for each LPL based on 10/350 µs waveform

LPL	I	II	III	IV
Maximum current (kA)	200	150	100	100
Minimum current (kA)	3	5	10	16

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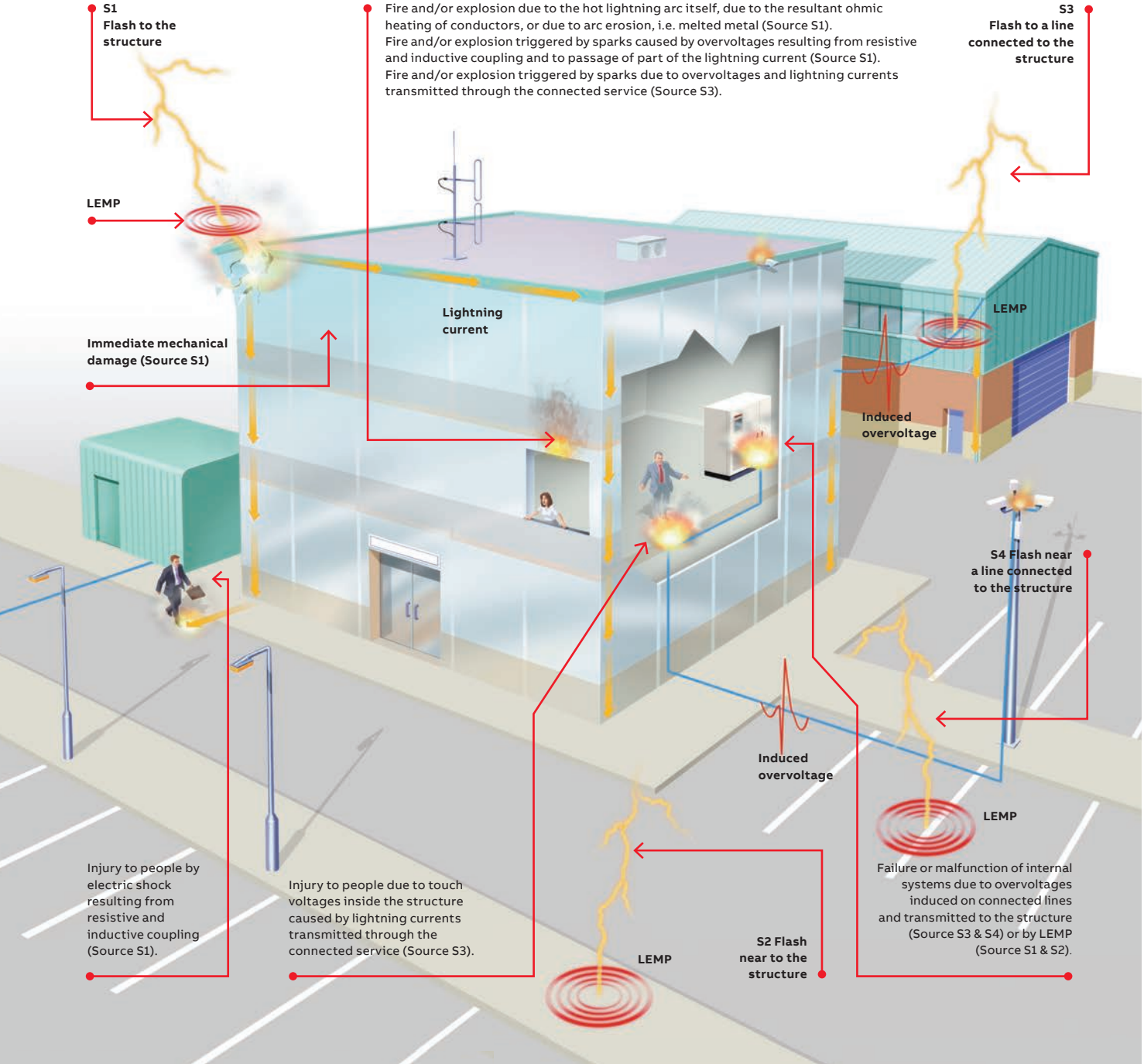

Technical reference

IEC/BS EN 62305-1 - Lightning protection zones (LPZ)

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02 The LPZ concept

Lightning protection zones (LPZ)
The concept of the Lightning Protection Zone (LPZ) was introduced within IEC/BS EN 62305 particularly to assist in determining the protection measures required to establish protection measures to counter Lightning Electromagnetic Impulse (LEMP) within a structure.

The general principle is that the equipment requiring protection should be located in an LPZ whose electromagnetic characteristics are compatible with the equipment stress withstand or immunity capability.

The concept caters for external zones, with risk of direct lightning strike, or partial lightning current occurring (LPZ 0) and levels of protection within internal zones (LPZ 1 & LPZ 2).

In general the higher the number of the zone (LPZ 2; LPZ 3 etc) the lower the electromagnetic effects expected. Typically, any sensitive electronic equipment should be located in higher numbered LPZs and be protected against LEMP by relevant Surge Protection Measures (SPM as defined in IEC/BS EN 62305).

SPM were previously referred to as a LEMP Protection Measures System (LPMS) in IEC/BS EN 62305:2006.

Figure 4 highlights the LPZ concept as applied to the structure and to SPM. The concept is expanded upon in IEC/BS EN 62305-3 and IEC/BS EN 62305-4.

Selection of the most suitable SPM is made using the risk assessment in accordance with IEC/BS EN 62305-2.

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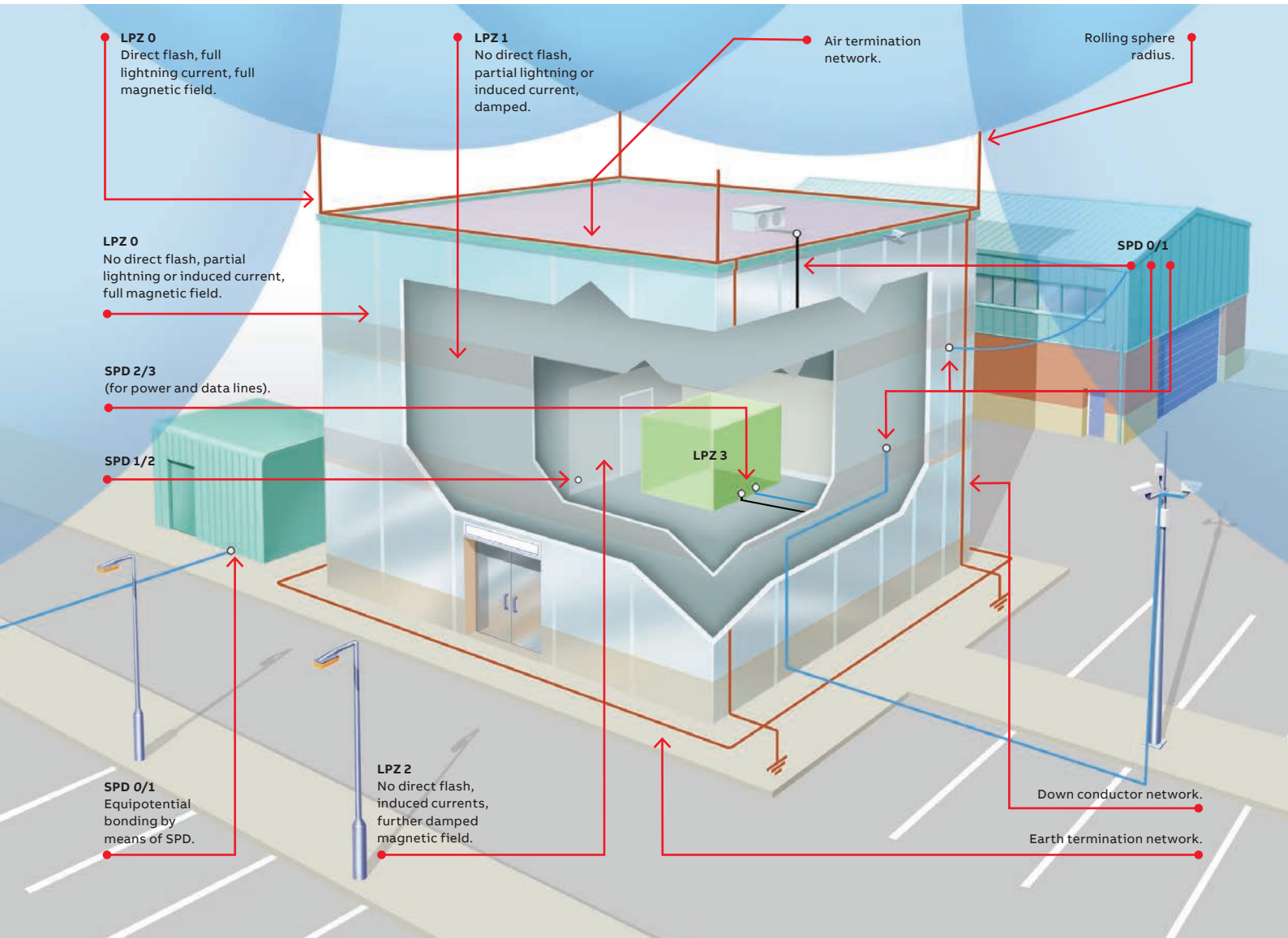

Technical reference
IEC/BS EN 62305-2 - Risk management

IEC/BS EN 62305-2 is key to the correct implementation of IEC/BS EN 62305-3 and IEC/BS EN 62305-4. The assessment and management of risk is now significantly more in depth and extensive than the approach of BS 6651.

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01 Procedure for deciding the need for protection (IEC/BS EN 62305-1 Figure 1).

IEC/BS EN 62305-2 specifically deals with making a risk assessment, the results of which define the level of Lightning Protection System (LPS) required. While BS 6651 devoted 9 pages (including figures) to the subject of risk assessment, IEC/BS EN 62305-2 currently contains over 140 pages.

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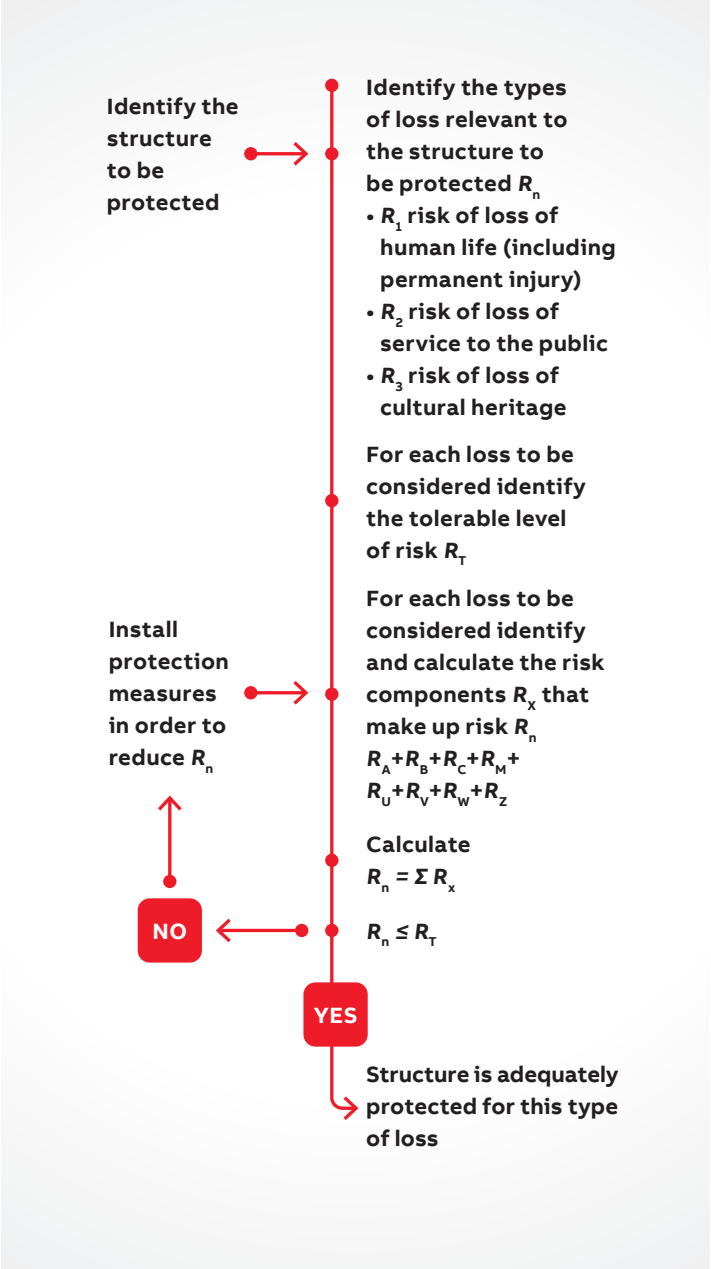


The first stage of the risk assessment is to identify which of the four types of loss (as identified in IEC/BS EN 62305-1) the structure and its contents can incur. The ultimate aim of the risk assessment is to quantify and if necessary reduce the relevant primary risks i.e.:

- R_1 risk of loss of human life (including permanent injury)
- R_2 risk of loss of service to the public
- R_3 risk of loss of cultural heritage
- R_4 risk of loss of economic value

For each of the first three primary risks, a tolerable risk (R_T) is set. This data can be sourced in Table 7 of IEC 62305-2 or Table NF.1 of the National Annex of BS EN 62305-2.

Each primary risk (R_n) is determined through a long series of calculations as defined within the standard. If the actual risk (R_n) is less than or equal to the tolerable risk (R_T), then no protection measures are needed. If the actual risk (R_n) is greater than its corresponding tolerable risk (R_T), then protection measures must be instigated. The above process is repeated (using new values that relate to the chosen protection measures) until R_n is less than or equal to its corresponding R_T.

It is this iterative process as shown in the Figure to the left that decides the choice or indeed Lightning Protection Level (LPL) of Lightning Protection System (LPS) and Surge Protective Measures (SPM) to counter Lightning Electromagnetic impulse (LEMP).

Technical reference
IEC/BS EN 62305-3 - Physical damage to structures & life hazard

IEC/BS EN 62305-3. This part of the suite of standards deals with protection measures in and around a structure.

The main body of this part of the standard gives guidance on the design of an external Lightning Protection System (LPS), internal LPS and maintenance and inspection programmes.

Lightning Protection System (LPS)
IEC/BS EN 62305-1 has defined four Lightning Protection Levels (LPLs) based on probable minimum and maximum lightning currents. These LPLs equate directly to classes of Lightning Protection System (LPS).

The correlation between the four levels of LPL and LPS is identified in Table 3. In essence, the greater the LPL, the higher class of LPS is required.

External LPS design considerations
The lightning protection designer must initially consider the thermal and explosive effects caused at the point of a lightning strike and the consequences to the structure under consideration. Depending upon the consequences the designer may choose either of the following types of external LPS:
- Isolated
- Non-isolated

External LPS design considerations
An Isolated LPS is typically chosen when the structure is constructed of combustible materials or presents a risk of explosion. Conversely a non-isolated system may be fitted where no such danger exists.

An external LPS consists of:
- Air termination system
- Down conductor system
- Earth termination system

These individual elements of an LPS should be connected together using appropriate lightning protection components (LPC) complying (in the case of BS EN 62305) with IEC/BS EN 62561 series. This will ensure that in the event of a lightning current discharge to the structure, the correct design and choice of components will minimise any potential damage.

Air termination system
The role of an air termination system is to capture the lightning discharge current and dissipate it harmlessly to earth via the down conductor and earth termination system. Therefore it is important to use a correctly designed air termination system.

IEC/BS EN 62305-3 advocates the following, in any combination, for the design of the air termination:
- Air rods (or finials) whether they are free-standing masts or linked with conductors to form a mesh on the roof
- Catenary (or suspended) conductors, whether they are supported by free-standing masts or linked with conductors to form a mesh on the roof
- Meshed conductor network that may lie in direct contact with the roof or be suspended above it (in the event that it is of paramount importance that the roof is not exposed to a direct lightning discharge)

The standard makes it quite clear that all types of air termination systems that are used shall meet the positioning requirements laid down in the body of the standard. It highlights that the air termination components should be installed on corners, exposed points and edges of the structure.

The three basic methods recommended for determining the position of the air termination systems are:
- The rolling sphere method
- The protective angle method
- The mesh method

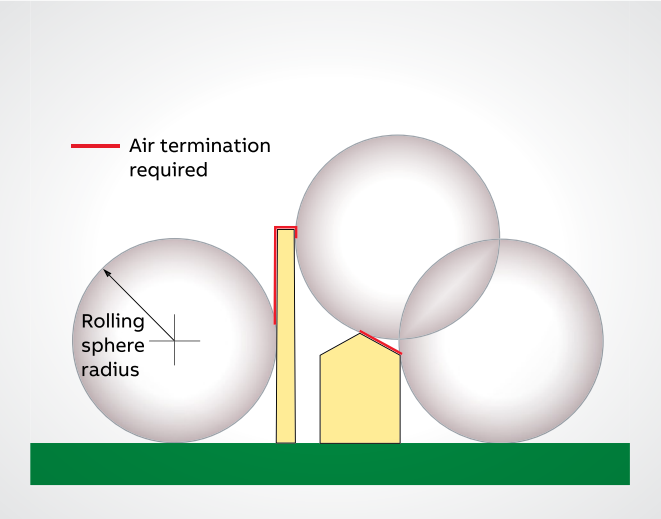
These methods are detailed over the following pages.

Table 3: Relation between Lightning Protection Level (LPL) and Class of LPS (IEC/BS EN 62305-3 Table 1)

LPL	Class of LPS
I	I
II	II
III	III
IV	IV

Technical reference

IEC/BS EN 62305-3 - Physical damage to structures & life hazard



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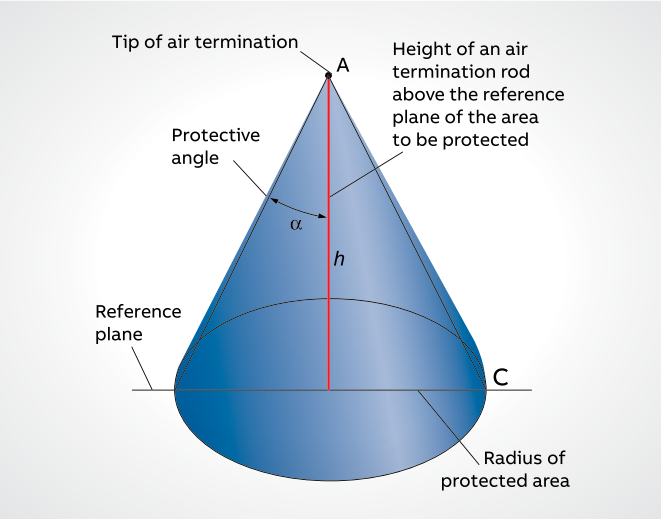

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01 Application of the rolling sphere method
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02 The protective angle method for a single air rod

The rolling sphere method
The rolling sphere method is a simple means of identifying areas of a structure that need protection, taking into account the possibility of side strikes to the structure. The basic concept of applying the rolling sphere to a structure is illustrated above.

The rolling sphere method was used in BS 6651, the only difference being that in IEC/BS EN 62305 there are different radii of the rolling sphere that correspond to the relevant class of LPS (see Table 4).This method is suitable for defining zones of protection for all types of structures, particularly those of complex geometry.

The protective angle method
The protective angle method is a mathematical simplification of the rolling sphere method. The protective angle (α) is the angle created between the tip (A) of the vertical rod and a line projected down to the surface on which the rod sits (see above).

The protective angle afforded by an air rod is clearly a three dimensional concept whereby the rod is assigned a cone of protection by sweeping the line AC at the angle of protection a full 360° around the air rod.

The protective angle differs with varying height of the air rod and class of LPS. The protective angle afforded by an air rod is determined from Table 2 of IEC/BS EN 62305-3.

Varying the protection angle is a change to the simple 45° zone of protection afforded in most cases in BS 6651. Furthermore the new standard uses the height of the air termination system above the reference plane, whether that be ground or roof level.

The protective angle method is better suited for simple shaped buildings. However this method is only valid up to a height equal to the rolling sphere radius of the appropriate LPL.

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Table 4: Max. values of rolling sphere radius corresponding to the Class of LPS

Class of LPS	Rolling sphere radius (m)
I	20
II	30
III	45
IV	60

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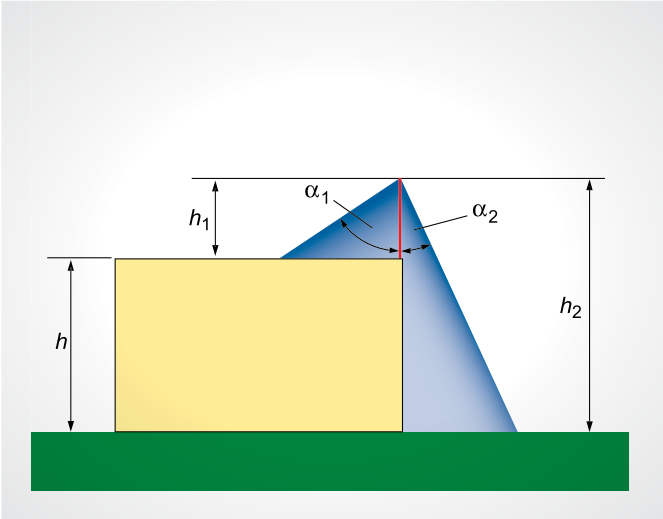
Table 5: Max. values of mesh size corresponding to the Class of LPS

Class of LPS	Mesh size (m)
I	5 x 5
II	10 x 10
III	15 x 15
IV	20 x 20



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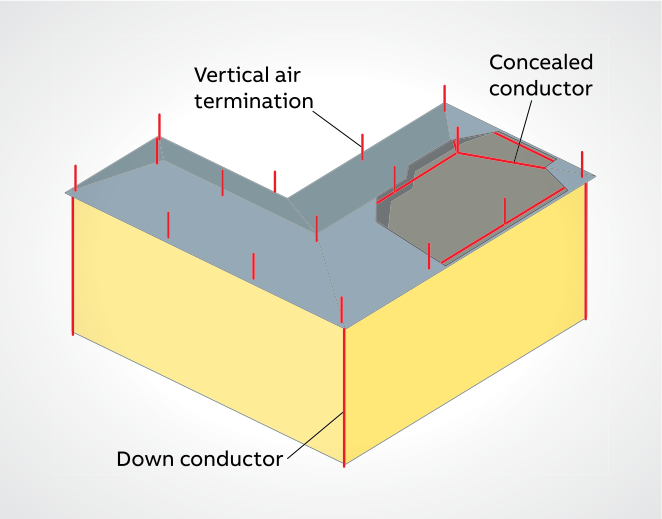

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03 Effect of the height of the reference plane on the protection angle
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04 Concealed air termination network
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05 Determination of the protective angle (IEC/BS EN 62305-3 Table 2)

The mesh method
IEC/BS EN 62305 lists four different air termination mesh sizes that are defined and correspond to the relevant class of LPS.

This method is suitable where plain surfaces require protection if the following conditions are met:

- Air termination conductors must be positioned at roof edges, on roof overhangs and on the ridges of roof with a pitch in excess of 1 in 10 (5.7°)
- No metal installation protrudes above the air termination system

Modern research on lightning inflicted damage has shown that the edges and corners of roofs are most susceptible to damage. So on all structures particularly with flat roofs, perimeter conductors should be installed as close to the outer edges of the roof as is practicable.

The IEC/BS EN 62305 Standard permits the use of conductors (whether they be fortuitous metalwork or dedicated LP conductors) under the roof. Vertical air rods (finials) or strike plates should be mounted above the roof and connected to the conductor system beneath.

The air rods should be spaced not more than 10 m apart and if strike plates are used as an alternative, these should be strategically placed over the roof area not more than 5 m apart.

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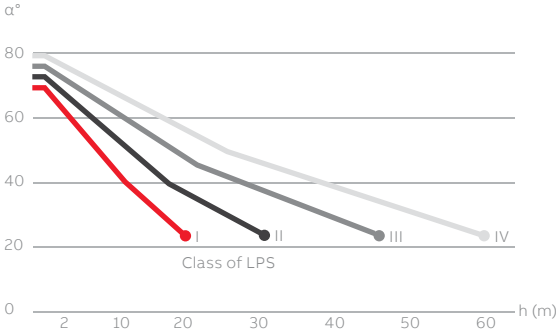


Note 1: Not applicable beyond the values marked with ●
Only rolling sphere and mesh methods apply in these cases
Note 2: *h* is the height of air-termination above the reference plane of the area to be protected
Note 3: The angle will not change for values of h below 2m

Technical reference
IEC/BS EN 62305-3 - Physical damage to structures & life hazard

Non-conventional air termination systems
A lot of technical (and commercial) debate has raged over the years regarding the validity of the claims made by the proponents of such systems. This topic was discussed extensively within the technical working groups that compiled IEC/BS EN 62305. The outcome was to remain with the information housed within this standard.

IEC/BS EN 62305 states unequivocally that the volume or zone of protection afforded by the air termination system (e.g. air rod) shall be determined only by the real physical dimension of the air termination system. This statement is reinforced within the 2011 version of IEC/BS EN 62305, by being incorporated in the body of the standard, rather than forming part of an Annex (Annex A of IEC/BS EN 62305-3:2006).

Typically if the air rod is 5 m tall then the only claim for the zone of protection afforded by this air rod would be based on 5 m and the relevant class of LPS and not any enhanced dimension claimed by some nonconventional air rods.

There is no other standard being contemplated to run in parallel with this standard IEC/BS EN 62305.

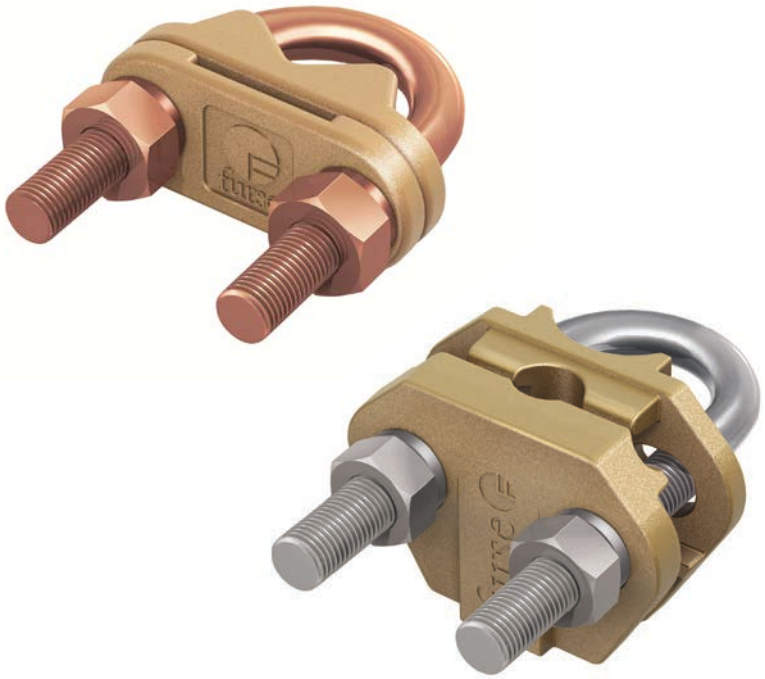


Table 6: Minimum thickness of metal sheets or metal pipes in air termination systems (IEC/BS EN 62305-3 Table 3).

Class of LPS	Material	Thickness[1] t	Thickness[2] t'
I to IV	Lead	–	2.0 mm
	Steel (stainless, galvanized)	4 mm	0.5 mm
	Titanium	4 mm	0.5 mm
	Copper	5 mm	0.5 mm
	Aluminium	7 mm	0.65 mm
	Zinc	–	0.7 mm

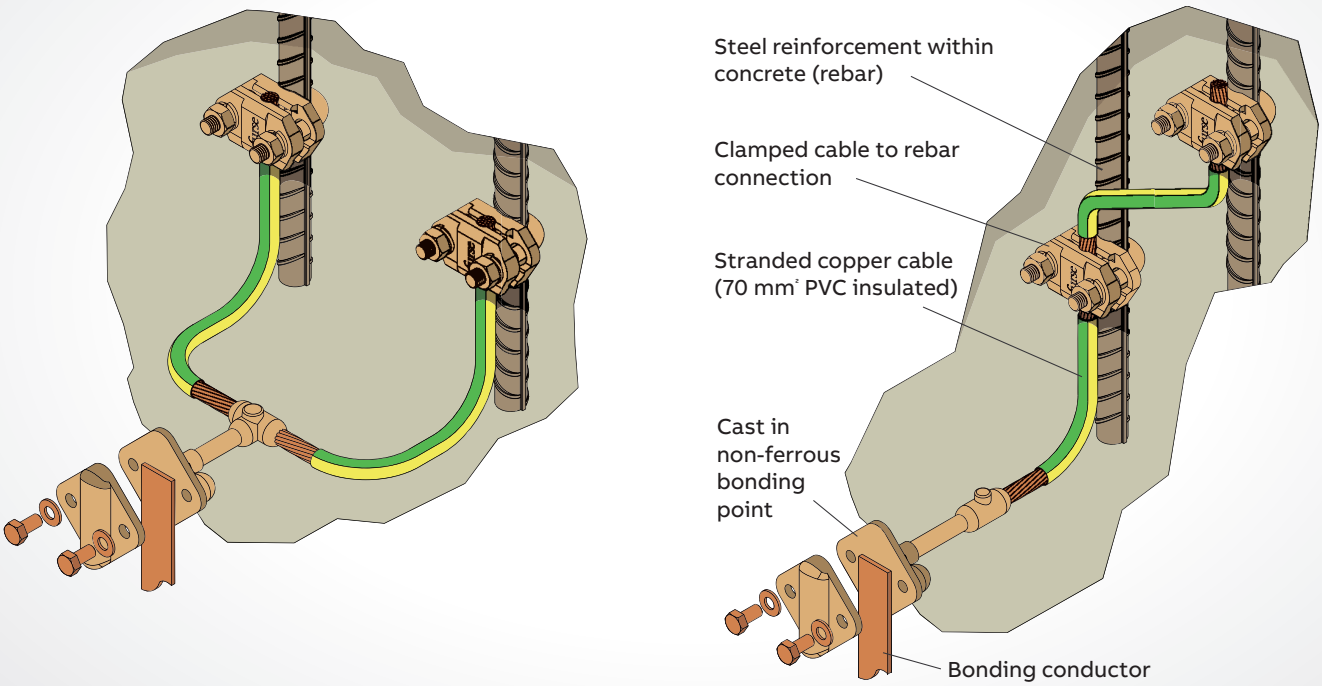
[1] Thickness t prevents puncture, hot spot or ignition.
[2] Thickness t' only for metal sheets if it is not important to prevent puncture, hot spot or ignition problems.

Natural components
When metallic roofs are being considered as a natural air termination arrangement, IEC/BS EN 62305 offers guidance on the minimum thickness and type of material under consideration, as well as additional information if the roof has to be considered puncture proof from a lightning discharge (see Table 6).

Down conductors
Down conductors should within the bounds of practical constraints take the most direct route from the air termination system to the earth termination system. The greater the number of down conductors the better the lightning current is shared between them. This is enhanced further by equipotential bonding to the conductive parts of the structure.

Lateral connections sometimes referred to as coronal bands or ring conductors provided either by fortuitous metalwork or external conductors at regular intervals are also encouraged. The down conductor spacing should correspond with the relevant class of LPS.

There should always be a minimum of two down conductors distributed around the perimeter of the structure. Down conductors should wherever possible be installed at each exposed corner of the structure as research has shown these to carry the major part of the lightning current.



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01 Typical methods of bonding to steel reinforcement within concrete.

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Table 7: Typical values of the distance between down conductors according to the Class of LPS (IEC/BS EN 62305-3 Table 4).

Class of LPS	**Typical distances**
I	10 m
II	10 m
III	15 m
IV	20 m

Natural components

IEC/BS EN 62305 encourages the use of fortuitous metal parts on or within the structure to be incorporated into the LPS. That these are welded, clamped with suitable connection components or overlapped a minimum of 20 times the rebar diameter. This is to ensure that those reinforcing bars likely to carry lightning currents have secure connections from one length to the next.

When internal reinforcing bars are required to be connected to external down conductors or earthing network either of the arrangements shown above is suitable. If the connection from the bonding conductor to the rebar is to be encased in concrete then the standard recommends that two clamps are used, one connected to one length of rebar and the other to a different length of rebar. The joints should then be encased by a moisture inhibiting compound.

If the reinforcing bars (or structural steel frames) are to be used as down conductors then electrical continuity should be ascertained from the air termination system to the earthing system. For new build structures this can be decided at the early construction stage by using dedicated reinforcing bars or alternatively to run a dedicated copper conductor from the top of the structure to the foundation prior to the pouring of the concrete. This dedicated copper conductor should be bonded to the adjoining/adjacent reinforcing bars periodically.

If there is doubt as to the route and continuity of the reinforcing bars within existing structures then an external down conductor system should be installed. These should ideally be bonded into the reinforcing network of the structures at the top and bottom of the structure.

Technical reference

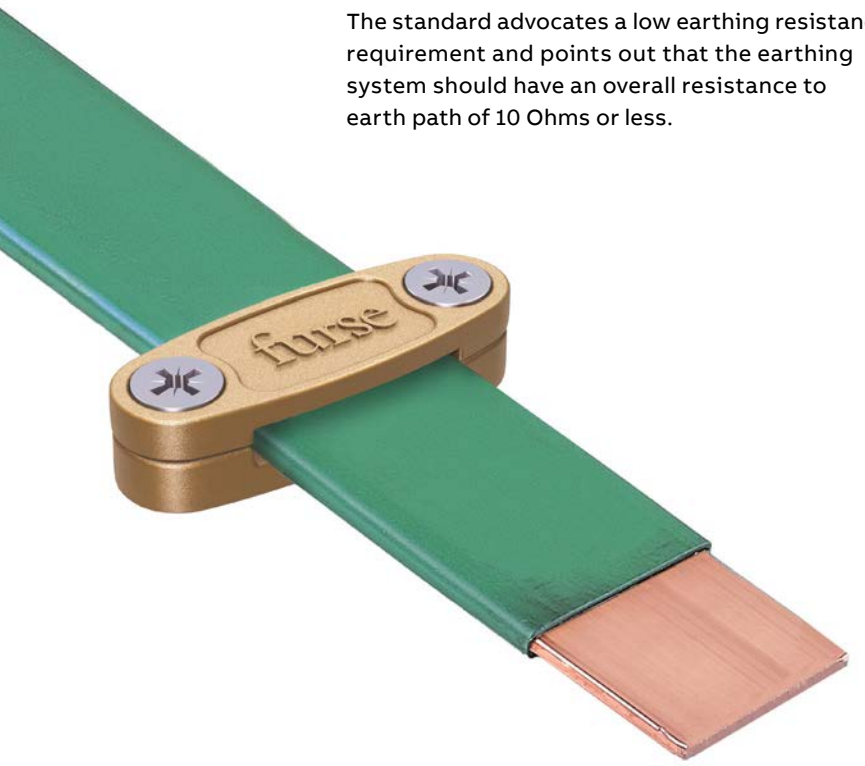
IEC/BS EN 62305-3 - Physical damage to structures & life hazard

Earth termination system
The earth termination system is vital for the dispersion of lightning current safely and effectively into the ground.

The standard recommends a single integrated earth termination system for a structure, combining lightning protection, power and telecommunication systems. The agreement of the operating authority or owner of the relevant systems should be obtained prior to any bonding taking place.

A good earth connection should possess the following characteristics:
- Low electrical resistance between the electrode and the earth. The lower the earth electrode resistance the more likely the lightning current will choose to flow down that path in preference to any other, allowing the current to be conducted safely to and dissipated in the earth
- Good corrosion resistance. The choice of material for the earth electrode and its connections is of vital importance. It will be buried in soil for many years so has to be totally dependable

The standard advocates a low earthing resistance requirement and points out that the earthing system should have an overall resistance to earth path of 10 Ohms or less.



Three basic earth electrode arrangements are used:
- Type A arrangement
- Type B arrangement
- Foundation earth electrodes

Type A arrangement
This consists of horizontal or vertical earth electrodes, connected to each down conductor fixed on the outside of the structure.

Type B arrangement
This arrangement is essentially a fully connected ring earth electrode that is sited around the periphery of the structure and is in contact with the surrounding soil for a minimum 80% of its total length (i.e. 20% of its overall length may be housed in say the basement of the structure and not in direct contact with the earth).

Foundation earth electrodes
This is essentially a type B earthing arrangement. It comprises conductors that are installed in the concrete foundation of the structure. If any additional lengths of electrodes are required they need to meet the same criteria as those for type B arrangement. Foundation earth electrodes can be used to augment the steel reinforcing foundation mesh.

Separation (isolation) distance of the external LPS
A separation distance (i.e. the electrical insulation) between the external LPS and the structural metal parts is essentially required. This will minimize any chance of partial lightning current being introduced internally in the structure.

This can be achieved by placing lightning conductors sufficiently far away from any conductive parts that have routes leading into the structure. So, if the lightning discharge strikes the lightning conductor, it cannot ‘bridge the gap’ and flash over to the adjacent metalwork.

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01 Example of main equipotential bonding.

Internal LPS design considerations
The fundamental role of the internal LPS is to ensure the avoidance of dangerous sparking occurring within the structure to be protected. This could be due, following a lightning discharge, to lightning current flowing in the external LPS or indeed other conductive parts of the structure and attempting to flash or spark over to internal metallic installations.

Carrying out appropriate equipotential bonding measures or ensuring there is a sufficient electrical insulation distance between the metallic parts can avoid dangerous sparking between different metallic parts.

Lightning equipotential bonding
Equipotential bonding is simply the electrical interconnection of all appropriate metallic installations/parts, such that in the event of lightning currents flowing, no metallic part is at a different voltage potential with respect to one another. If the metallic parts are essentially at the same potential then the risk of sparking or flashover is nullified.

This electrical interconnection can be achieved by natural/fortuitous bonding or by using specific bonding conductors that are sized according to Tables 8 and 9 of IEC/BS EN 62305-3.

Bonding can also be accomplished by the use of surge protective devices (SPDs) where the direct connection with bonding conductors is not suitable.

The Figure below (which is based on IEC/BS EN 62305-3 fig E.43) shows a typical example of an equipotential bonding arrangement. The gas, water and central heating system are all bonded directly to the equipotential bonding bar located inside but close to an outer wall near ground level. The power cable is bonded via a suitable SPD, upstream from the electric meter, to the equipotential bonding bar. This bonding bar should be located close to the main distribution board (MDB) and also closely connected to the earth termination system with short length conductors. In larger or extended structures several bonding bars may be required but they should all be interconnected with each other.

The screen of any antenna cable along with any shielded power supply to electronic appliances being routed into the structure should also be bonded at the equipotential bar.

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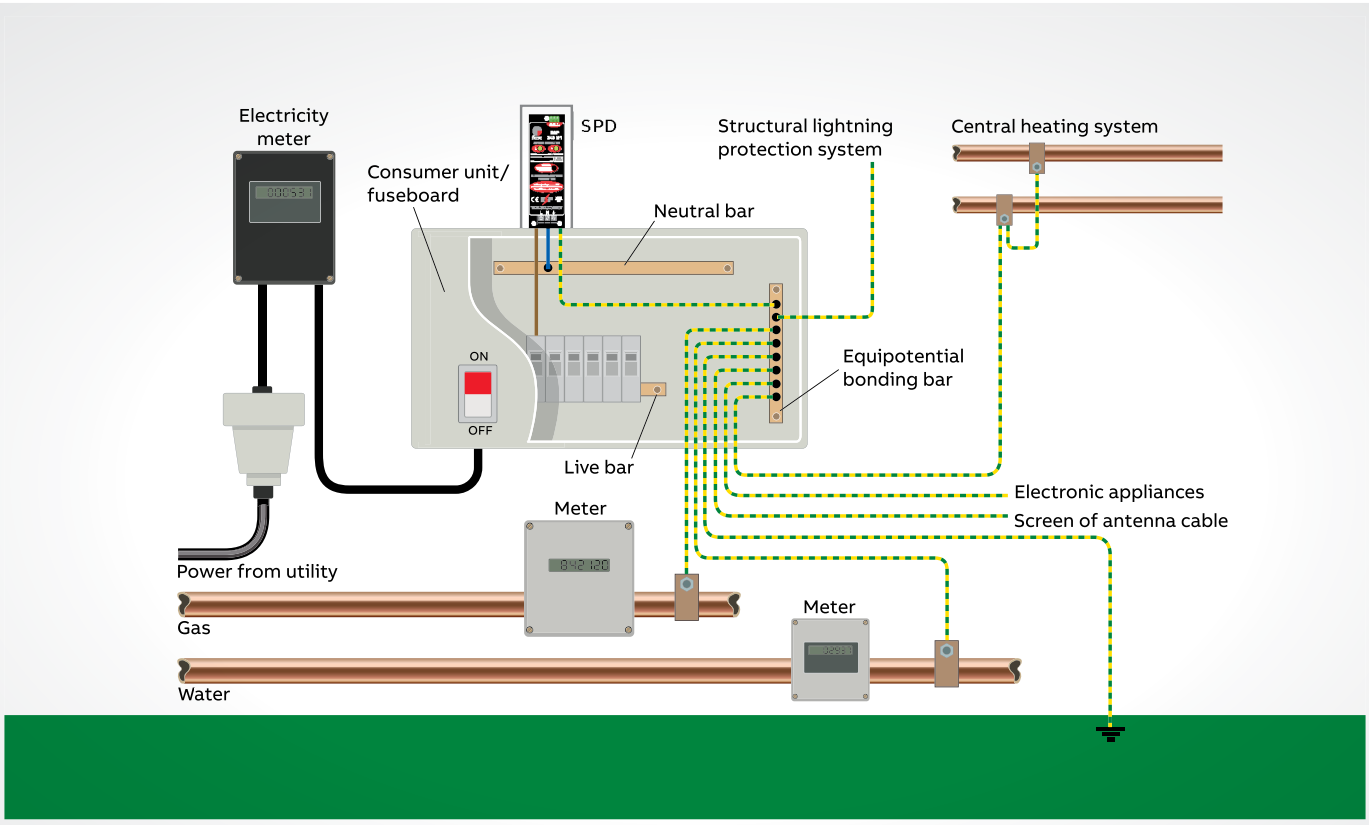

Technical reference
IEC/BS EN 62561 series - Lightning protection system components

The IEC/BS EN 62561 series of standards focuses on design and performance of components which are to be installed in an external LPS.

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01 Environmental ageing chamber for ammonia atmosphere ageing.

Designers/users of these systems need to be assured that the components, conductors, earth electrodes etc. that will be installed have the requisite durability to survive long term exposure to the environmental elements whilst retaining the ability to dissipate lightning current safely and harmlessly to earth.

The IEC/BS EN 62561 series of standards defines the processes by which these critical lightning protection components are judged fit for purpose.

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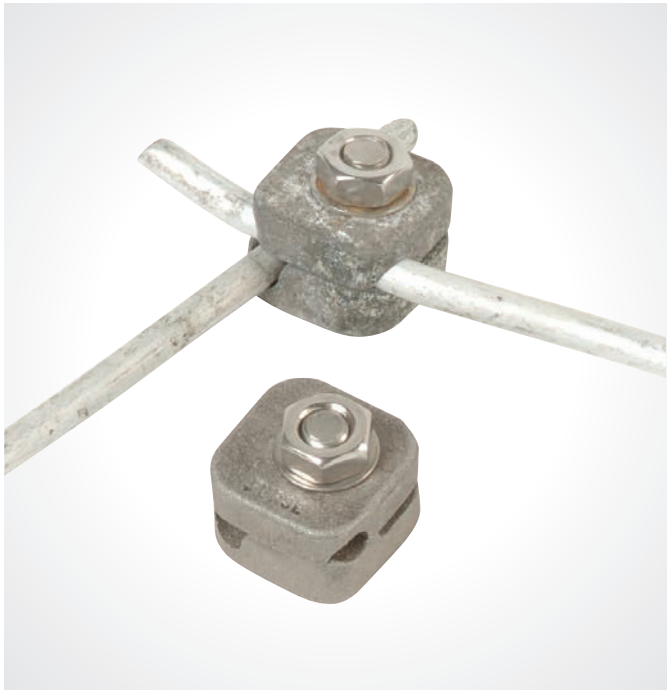
There are currently eight parts to the series:

- **IEC/BS EN 62561-1** Lightning protection system components (LPSC) Part 1: Requirement for connection components
- **IEC/BS EN 62561-2** Lightning protection system components (LPSC) Part 2: Requirements for conductors and earth electrodes
- **IEC/BS EN 62561-3** Lightning protection system components (LPSC) Part 3: Requirements for isolating spark gaps (ISG)
- **IEC/BS EN 62561-4** Lightning protection system components (LPSC) Part 4: Requirements for conductor fasteners
- **IEC/BS EN 62561-5** Lightning protection system components (LPSC) Part 5: Requirements for earth electrode inspection housings and earth electrode seals
- **IEC/BS EN 62561-6** Lightning protection system components (LPSC) Part 6: Requirements for lightning strike counters
- **IEC/BS EN 62561-7** Lightning protection system components (LPSC) Part 7: Requirements for earth enhancing compounds
- **IEC TS 62561-8** Lightning protection system components (LPSC) Part 8: Requirements for components for isolated LPS.

Independent testing
IEC/BS EN 62561 series requires manufacturers to undertake thorough testing and performance measurement of their components in order to gain compliance.

Three specimens of the component are tested, with conductors and specimens prepared and assembled in accordance with the manufacturer's instructions, e.g. to recommended tightening torques.

Testing can include environmental preconditioning (various treatments such as salt mist spray or exposure to a humid sulphurous atmosphere etc.) followed by subjecting components to simulated lightning discharges to assess their capacity to cope with onerous conditions.



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02 Furse lightning protection components, showing results after environmental preconditioning and lightning discharge testing.

Environmental preconditioning is designed to rapidly replicate the effect of component ageing under expected environmental conditions at site, to prove the component's ability to conduct lightning over time. Testing therefore ensures components have been appropriately constructed for their application, meet the requirements of the standard and will prove safe in use for a number of years.

Furse product tests are undertaken by an independent Certified test laboratory - The Research Development and Certification Centre, High Voltage and High Current Testing Laboratory - to ensure our products conform.

Passing the test
Each part of IEC/BS EN 62561 defines its own criteria for satisfactory performance of components.

All three specimens of a tested component must satisfy the conditions set out by IEC/BS EN 62561 in order for the testing to be deemed successful.

Following testing, a full test report with certification should be produced by the independent laboratory for all components satisfying the test criteria.

IEC/BS EN 62561 requires manufacturers to retain the test report along with adequate documentation to support testing and product application, including installation instructions.

Furse component performance
By choosing lightning protection components conforming to the IEC/BS EN 62561 series, the designer ensures he or she is using the best products on the market and is in compliance with IEC/BS EN 62305.

Furse structural lightning protection components are therefore rigorously tested to this standard.

Through independent testing, Furse products are proven to withstand the constant exposure to the environment as required by an LPS, thereby ensuring they will continue to dissipate lightning current safely and harmlessly to earth over the long term.

Technical reference
Earthing standards

Installation of a well designed earthing system is a fundamental requirement for all structures and electrical systems (at all voltages).

Effective earthing safeguards people from risk of electric shock, in that 'hazardous-live-parts shall not be accessible and accessible conductive parts shall not be hazardous live', and ensures a low impedance route to the general mass of earth for currents in the electrical system, under both normal and fault conditions.

A number of national and international standards have been published which define earthing system design parameters for structures, electrical equipment and systems, including:

- **BS EN 50522:** Earthing of power installations
- exceeding 1kVac
- **BS 7430:** Code of practice for protective earthing of electrical installations
- **BS 7354:** Code of practice for design of high voltage open terminal stations
- **IEEE Std 80:** IEEE Guide for safety in AC
- substation grounding
- **ENA TS 41-24** Guidelines for the design, installation, testing and maintenance of main earthing systems in substations

The design, specification, inspection and periodic testing of earthing systems should follow the guidance and recommendations provided by these standards.

BS 7430: Protective earthing of electrical installations

British Standard BS 7430 provides guidance on earthing of general land-based electrical installations in and around buildings in the UK, and considers:

- Low voltage installation earthing and equipotential bonding for general, industrial and commercial buildings, locations with increased risk, rail systems etc
- The interface between low voltage and high voltage substations
- Earthing of generators and Uninterruptible Power Supplies (UPSs) supplying low voltage installations

BS 7430 defines the elements for creating an appropriate earthing arrangement for a low voltage installation, including a main earthing terminal, protective conductors, earthing conductors and circuit protective conductors, and the use of earth electrodes to dissipate currents to the general mass of earth. Extending the earthing arrangement through the use of equipotential bonding measures to cover exposed and conductive metal parts is further recommended to protect against step and touch voltages, and to remove risk of dangerous sparking. Five classes of low voltage electrical installation are defined within the standard - TN-S, TN-C, TN-C-S, TT and IT.

Performance requirements for earthing these low voltage installations are defined in the IET Wiring Regulations, BS 7671.

The earthing arrangement should be sufficiently robust to ensure it lasts the lifetime of the installation, and be protected from mechanical damage and corrosion so that it remains capable of carrying the maximum expected current, for which it is specified, under both normal and fault conditions.

BS 7430 therefore defines selection parameters for the earthing arrangement, e.g. the size and material for conductors, earth electrodes etc, and makes clear the need for careful consideration of site conditions (soil composition and resistivity).

Taking actual measurements at the site is important to gauge the expected effectiveness of the earthing arrangement, and guidance is provided for measuring resistance calculations for earth plates, earth rods, ring conductor and foundation earth electrodes.

Where necessary in high resistivity areas or on rocky ground, treatment of the soil through use of an earth electrode backfill is recommended to improve earth contact resistance.

Substation earthing
BS EN 50522, BS 7354, IEEE std. 80 and ENA TS 41-24 reference the requirements for earthing of substations.

The design and specification of an appropriate earthing arrangement for substations is essential to provide a low impedance path for earth fault, and lightning currents, and to protect personnel on site from potentially fatal step and touch voltages. These standards provide guidance on (but not limited to):

- Maximum permitted step and touch voltages
- Methods for calculating earthing system design
- High voltage earth electrode selection, including type, material and size
- Switching and busbar arrangement
- Equipotential bonding
- Insulation co-ordination

Primary to these standards is limiting earth potential rise (EPR) under earth fault conditions so that step and touch potential limits are not exceeded, and earth resistance remains as low as possible. Essentially, use of an earthing grid consisting of horizontal cross-bonded earthing conductors is recommended, augmented by earth rods where the site includes low resistivity layers beneath the surface. These earth rods mitigate seasonal variations in earth grid resistance at the grid's burial depth.

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Additional information
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