EARTHING SOLUTION



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Product Range Tested by Country's Prestigious Testing Centres:







An Overview of Doksun's Earthing/Grounding Services:

The most important safety system in any building or zone is the one protecting from the hazards of fault current. Earthing/grounding systems have to perform effectively all the time; if a deficiency in the system is unnoticed or unaddressed it may result in damage to equipment, operational failure or the death of living beings. Consequently prudent organizations refuse to compromise on the provision for earthing/grounding and demand Doksun make designs and products.

All construction projects have to address the challenges presented by fault electrical current. A failure to effectively protect against fault current can have disastrous, even fatal consequences. For this reason it is essential that the scale of the potential hazard is established in advance and then specifically addressed through an effective earthing/grounding design and it is for this reason that prudent companies seek Doksun to support this provision.

However, an earthing/grounding system design alone will not achieve anything, it is only through the careful application of that design, utilizing the products and methods defined in the installation method statements that safety can be achieved, and this system should then be maintained throughout its functional life. These measures are obvious, but so often overlooked or ignored. A design comes from a risk assessment, and the sector recognizes the need to follow the measures identified in risk assessments so the design to installation process should be no exception. Focused designers like Doksun team are able to define the specific products required to complete an installation. Removing ambiguity or need for interpretation ensures that the effective system determined through expert design can be actualized with the exact products. Any departure from those materials identified in the design potentially introduces variables in terms of the performance of a system after it has been installed.

Doksun make products, often specified by many MNCs and PSUs are recognized throughout the globe as being of the highest standard, the Doksun make portfolio of products has been specified on an array of prestigious construction programs, including power projects, infrastructure projects, and significant builds.

The Doksun technical team can offer a complete support package for earthing/grounding. Design of earthing/grounding systems is a main strength of Doksun that enables us to outperform other sector companies. To ensure that your staff has knowledge of up to the minute earthing/grounding developments Doksun team can provide training or consultancy to assist your team.

Our designs are completed with a focus upon the threats of step and touch voltages, transferred potentials and the safety criteria that governs the effectiveness of such systems. Our design software is capable of simulating electrical faults on a design to ascertain its performance and establish its effectiveness.

All designs created by our technical department can be processed simultaneously through our operations department, should you wish to accelerate the process into a material order; however there is no obligation for you to do so, the design service is provided independently, a further demonstration of the Doksun Group's robust and expansive ability to support organizations of any size.

Our market-leading services in Earthing/Grounding include:

Consultancy: The clients that avail themselves of this service include architects, consultants, project managers and team leaders, all of which can undertake their own job in full confidence that at any time they can contact a specialist for support. Doksun Group consultants are often sought by name and are able to support a project from inception to commissioning and delivery. Specification creation and review: A construction specification is a critical document and will play an integral part in the ultimate success of the project. Unfortunately specifications frequently cite superseded or obsolete standards, or implement criteria which can not only be outdated, but incorrect. Prudent consultants often seek to contact Doksun to verify that electrical safety aspects are wholly accurate and prescribe the relevant safety performance levels.

Risk profiling: To provide the most effective earthing/grounding solution, the correct risk profile of a site must be determined. An inaccurate risk profile will reflect a distorted perception of risk, which could result in either an over-specified earthing system that would lead to unnecessary expenditure, or more dangerously an under-specified earthing system which could mean that threats to assets and life remain unaddressed in the final installation. As risk profiling is a performance critical element the expertise of the Doksun is obtained to ensure that the protection levels determined are accurate.



Design of earthing/grounding systems: With Doksun being the most respected earth system design consultancy in the sector, the Doksun is recognized as a prudent choice in determining earth system designs. Being able to deliver effective earth system designs for everything from localized equipment earthing to power stations or oil refineries, Doksun is the logical choice for any project. Utilizing knowledge of the latest developments in the sector, their robust portfolio of design software, and the ability to design to any applicable or required standard Doksun deliver on time and with installation method statements.

Site surveys and system testing: Whether a site requires a detailed soil resistivity survey, or thorough examination and collation of system performance data, Doksun can undertake such works and ensure that it feeds into earthing designs or performance assessments.

Advice and troubleshooting: Whether it is a quick query or the need for involved assistance, our robust team is used on projects all over the world to provide short notice support.

Earthing/Grounding Systems, an Overview:

Earthing systems are installed to protect structures from the threats of fault electrical currents. Electricity has the capacity to kill people instantly and it is for the reason that all constructions must place great emphasis on quality in their electrical safety systems.

Earthing systems are engineered to provide a safe, low impedance path to earth/ground for fault currents. Earthing is also used to protect and preserve equipments and assets, which is essential in ensuring the ongoing functionality of a site. Without question the most important cable in any electrical system is the earth cable, which directs fault current safely away from a location by allowing it to dissipate into the strata of the earth. Electricity, be it in the form of a supply or lightning, is always seeking the most direct and easy path to ground and through astute planning a site can dictate and provide that route. If a location does not have an adequate earthing provision it may lead to electricity finding alternate methods to ground, this is often through electrical equipment. but in certain circumstances it can be via human beings. Another main objective of earthing electrical safety systems is to establish a common reference potential for the power supply system, building structures, plant steelwork, electrical conduits and instrumentation system. Performance of any earth system is dictated by soil resistivity, stratification, type and size of electrode used, location and depth to which the electrode is buried, moisture and chemical content of the soil, but these shall be examined in further detail in the following.

What is Resistance?

Any earth system must be take account of a range of differing electrical resistance, but what is resistance? Resistance is the property of a conductor which opposes electric current flow when a voltage is applied across two ends. Its unit of measure is the ohm (W) and the commonly used word is R. Resistance is the ratio of the applied voltage (V) to the resulting current flow (I) as defined by the well known linear equation from ohm's law:

$V = I \times R$

Where: V is the potential differences across the conductor (Volts), I is the current flowing through the conductor in (Amperes), R is the resistance of the conductor in (Ohms). The resistance of the conductor depends on the atomic structure of the material. Resistivity is the property of a material that measures its ability to conduct electricity.

Soil Resistivity, an Overview:

The resistance performance of an earth electrode is heavily influenced by the resistivity of the soil in to which it is driven. Soil resistivity is the resistance measured between two opposing surfaces of 1m³ of the homogeneous ground material, usually measured in ohm (W). The evaluation of the resistivity of the local soil determines the best location, depth and size of the electrodes in an earth/ground system. Soil resistivity is determined largely by its content of electrolytes, which consist of moisture, minerals and dissolved salts. Because soil resistivity directly relates to moisture content and temperature, it is reasonable to assume that the resistance of any earth system will vary throughout the different seasons of the year. Since both temperature and moisture content become more stable at greater depths below the surface of the ground, it follows that an earth system to be most effective at all times should be constructed with the earth rod driven down the considerable depth below the surface. Best results are obtained if the earth rod/electrode penetrates the water table.

Soil Resistivity Data & Earth System Design:

It is advisable to locate in the area of lowest soil resistivity in order to achieve the most economical earthing system installation as it will perform more effectively and require fewer earthing materials.

Some well known companies with great products & offers wide range of testing meters are:



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Knowledge of the soil resistivity at the intended site, and how this varies with parameters such as moisture content, temperature and depth, provides and insight into how the desired earth resistance can be achieved and maintained over the life of the installation with minimum cost and effort. Many different factors have a direct effect on the resistivity of the local soil, the resistivity of different types of ground material ranges from <1 W to the upwards of over 1,00,000 W . Soil is also major factor in affecting corrosion rate as soil resistivity decreases, corrosion increases, as soil moisture content increases, resistivity decreases, atmospheric conditions can significantly affect soil resistivity.

This advance earthing system works in two folds :

1. The Earth Electrode has strip in pipe concept that involves two low carbon mild steel pipe and one strip inserted inside the pipe. The outer pipe has an anti rust coating of 250 micron. The pipe and strip both are of Indian specifications 1239 medium class as prescribed by earthing manual of Indian standard 3043 that is 3.6 mm wall thickness. The empty space inside the electrode is pressure filled with high conductive crystalline mixture specially formulated and developed to create a minimum resistive path within the electrode.

2. Ground improving material is a back fill compound that is added in the soil around the earth electrode within the sphere of influence of the electrode to increase the effectiveness of the earthing system. The compound being hygroscopic in nature it maintains the moisture level during seasonal imbalances. The compound is also very conductive hence eliminates the use of salt and charcoal and maintain the conductive nature of soil and the compound is also very swelling in nature thus it eliminates air pockets in the soil and increases the contact area with the electrode.

Keeping all the critical aspects of an earthing/grounding system, we came forward with a revolutionary product.

1. Maintenance free nature, no need to add water in regular intervals as in conventional system.

2. Consistency, continuously maintains the same (approx) resistence value over the regardless of soil and climatic conditions.

3. More surface area, the conductive compound in and around the electrode creates a conductive zone which provides a greater surface area for peak current dissipation.

4. Easy Installation, can be installed indoors or outdoors and in all most any soil condition.

5. Corrosion resistant, intelligently designed to resist corrosion and give long life.

6. Meets the guidelines as per IS:3043-1987 mandates.



Product Code:	DP333CU	DP4823CZ	DP6323CZ	DP7823CZ
Diameter :	33 mm	48 mm	63 mm	78 mm
Length:	3 Mtrs.	2 & 3 Mtrs.	2 & 3 Mtrs.	2 & 3 Mtrs.
Wall Thickness:	3.2 mm	3.2 mm	3.6 mm	3.6 mm
Coating Available:	Copper/GI	Copper/GI	Copper/GI	Copper/GI
Coating Thickness:	Upto 250 µ	Upto 250 µ	Upto 250 µ	Upto 250 µ
Terminal Hole:	10 mm	10 mm	13 mm	13 mm
Cross Section Area:	316 mm²	481 mm²	616 mm²	892 mm²
Lug Size:	25 x 6 x 100	40 x 6 x 100	50 x 6 x 100	50 x 10 x 100
Current Rating:	7.5 kA Peak	30 kA Peak	50 kA Peak	75 kA Peak
Application:	Domestic	Comm./Ind.	Industrial	Heavy Ind.



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TESTING METHODS AND INSTRUMENTS IN USE:

The insulation resistance (IR) test (also commonly known as a Megger) is a spot insulation test which uses an applied DC voltage (typically either 250Vdc, 500Vdc or 1,000Vdc for low voltage equipment <600V and 2,500Vdc and 5,000Vdc for high voltage equipment) to measure insulation resistance in either k ohms, M ohms or G ohms. The measured resistance is intended to indicate the condition of the insulation or dielectric between two conductive parts, where the higher the resistance, the better the condition of the insulation. Ideally, the insulation resistance would be infinite, but as no insulators are perfect, leakage currents through the dielectric will ensure that a finite (though high) resistance value is measured.

Because IR testers are portable, the IR test is often used in the field as the final check of equipment insulation and also to confirm the reliability of the circuit and that there are no leakage currents from unintended faults in the wiring (e.g. a shorted connection would be obvious from the test results).

One of the advantages of the IR test is its non-destructive nature. DC voltages do not cause harmful and/or cumulative effects on insulation materials and provided the voltage is below the breakdown voltage of the insulation, does not deteriorate the insulation. IR test voltages are all well within the safe test voltage for most (if not all) insulation materials.

An ohmmeter is an electrical instrument that measures electrical resistance, the opposition to an electric current. Micro-ohmmeters (microhmmeter or microohmmeter) make low resistance measurements. Megohmmeters (aka megaohmmeter or in the case of a trademarked device Megger) measure large values of resistance. The unit of measurement for resistance is ohms. The first ohmmeters were based on a type of meter movement known as a 'ratiometer'. These were similar to the galvanometer type movement encountered in later instruments, but instead of hairsprings to supply a restoring force they used conducting 'ligaments' instead. These provided no net rotational force to the movement. Also, the movement was wound with two coils. One was connected via a series resistor to the battery supply. The second was connected to the same battery supply via a second resistor and the resistor under test. The indication on the meter was proportional to the ratio of the currents through the two coils. This ratio was determined by the magnitude of the resistor under test. The advantages of this arrangement were twofold. First, the indication of the resistance was completely independent of the battery voltage (as long as it actually produced some voltage) and no zero adjustment was required. Second, although the resistance scale was non linear, the scale remained correct over the full deflection range. By interchanging the two coils a second range was provided. This scale was reversed compared to the first. A feature of this type of instrument was that it would continue to indicate a random resistance value once the test leads were disconnected (the action of which disconnected the battery from the movement).

Ohmmeters of this type only ever measured resistance as they could not easily be incorporated into a multimeter design. Insulation testers that relied on a hand cranked generator operated on the same principle. This ensured that the indication was wholly independent of the voltage actually produced.

A more accurate type of ohmmeter has an electronic circuit that passes a constant current (I) through the resistance, and another circuit that measures the voltage (V) across the resistance. According to the following equation, derived from Ohm's Law, the value of the resistance (R) is given by: For high-precision measurements the above types of meter are inadequate. This is because the meter's reading is the sum of the resistance of the measuring leads, the contact resistances and the resistance being measured. To reduce this effect, a precision ohmmeter has four terminals, called Kelvin contacts. Two terminals carry the current from the meter, while the other two allow the meter to measure the voltage across the resistor. With this type of meter, any voltage drop due to the resistance of the first pair of leads and their contact resistances is ignored by the meter. This four terminal measurement technique is called Kelvin sensing, after William Thomson, Lord Kelvin, who invented the Kelvin bridge in 1861 to measure very low resistances. The Four-terminal sensing method can also be utilized to conduct accurate measurements to low resistances.

In electrical and electronic engineering, a current clamp or current probe is an electrical device having two jaws which open to allow clamping around an electrical conductor. This allows properties of the electric current in the conductor to be measured, without having to make physical contact with it, or to disconnect it for insertion through the probe. Current clamps are usually used to read the magnitude of a sinusoidal current (as invariably used in alternating current (AC) power distribution systems), but in conjunction with more advanced instrumentation the phase and waveform are available. Very high alternating currents (1000 A and more) are easily read with an appropriate meter; direct currents, and very low AC currents (milliamperes) are more difficult to measure.

Series
$$R_1$$
 R_2 R_3 $R_{equivalent} = R_1 + R_2 + R_3 + \dots$

$$R_{equivalent} = \frac{V}{I} = \frac{V_1 + V_2 + V_3 + \dots}{I} = \frac{V_1}{I_1} + \frac{V_2}{I_2} + \frac{V_3}{I_3} + \dots = R_1 + R_2 + R_3 + \dots$$

Series key idea: The current is the same in each resistor by the current law.

Parallel
$$R_1 \ge R_2 \ge R_3 \ge R_3 \ge R_1 \ge R_2 \ge R_3 \ge R_3 \ge R_3 \ge R_2 \ge R_3 = R_3 \ge R_3 \ge R_3 = R$$

 $\begin{aligned} \frac{V}{R_{equivalent}} &= I = I_1 + I_2 + I_2 + \ldots = \frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} + \ldots \\ \frac{1}{R_{equivalent}} &= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots \end{aligned}$

Parallel key idea: The voltage is the same across each resistor by the voltage law

 $R_{eq} = R_1 + R_2 + ... R_n$ Example: 100\(\Omega \cdot 300\(\Omega \cdot 200\) = 100\(\Omega + \cdot 300\(\Omega \cdot 200\) = 400\(\Omega \cdot 200\)





Product Line: GROUNDING / EARTH PROTECTION - TESTING REPORT @ 63 kA rms for 1.2 Sec.





www.doksunpower.com

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Product Line: GROUNDING / EARTH PROTECTION - APPROVALS/REGISTRATIONS AND LICENCES





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Doksun make copper bonded earth/grounding rods:

Doksun offers the client one of the most reliable and durable method of achieving a low earth resistance, the Doksun make copper bonded earth/ground rods has a high tensile strength, low carbon steel core. 99.95% pure copper is applied electrolytically and forms a metallurgical bond between the steel core and copper. This combination makes the rod ideal for deep driving whilst also provides lasting resistance to corrosion.

The threads are formed by a cold rolling process which ensures strength and maintains the molecularly bonded copper covering along the full length of the threads. Cold rolled threads are better and stronger than cut threads. The standard copper thickness is 250 μ greater copper thickness leads to better conductivity also.







- Cost effective long service life.
- Strong copper bonded coating.
- Permanent molecular bond.
- Low resistance high performance.
- High fault current capacity.
- Do not slip or tear when driven.
- Coating or core is not cracked if bent.
- Carbon steel / stainless steel core.
- Greater tensile strength.
- Deep driving capability.
- Tip made by En8 hardened steel.

THE DOKSUN MAKE EARTHING/GROUNDING SOLID RODS COMES IN THE FOLLOWING DIMENSIONS TO SUIT YOUR NEEDS:

Product Code:	DPSR14CU	DPSR17CU	DPSR25CU	DPSR32CU	DPSR38CU		
Diameter :	14 mm	17 mm	25 mm	32 mm	38 mm		
Length:	2 & 3 Mtrs.	2 & 3 Mtrs.	2 & 3 Mtrs.	2 & 3 Mtrs.	2 & 3 Mtrs.		
Coating Available:	Copper	Copper	Copper	Copper	Copper		
Coating Thickness:	Upto 250 µ	Upto 250 µ	Upto 250 µ	Upto 250 µ	Upto 250 µ		
Cross Section Area:	153.86 mm²	226.86 mm ²	490.62 mm²	803.84 mm²	1133.54 mm²		
Current Rating:	6 kA Peak	9 kA Peak	15 kA Peak	25 kA Peak	30 kA Peak		
Application:	Domestic	Domestic	Domestic	Domestic	Domestic		
LENGTH OF THE RODS SHALL BE MORE AS PER PROJECT'S TECHNICAL FEASABILITY.							

DGKSUN



Product: Doksun make earth/grounding compound

General Description: Doksun make earth/grounding compound is a high swelling specially formulated homogenous compound based upon bentonite and other similar key elements, to create low resistivity in and around earth pit as desired. It provides a better conductivity and moisture retaining capacity and free from any toxic material hence safe to use product of mass use in projects. The greatest advantage of this product is that it eliminates use of charcoal & salt and doesn't shrink or crack with time.

Product Features: Based upon high swelling bentonite and similar key elements.

Swells up to 20% of its volume. Low seepage rate. High moisture retaining capacity. High conductive property, by added chemical & metallic composition. Non corrosive. Non toxic.

Please note: The property of Doksun make earth/grounding compound largely depends upon quality of water used. In hard water the properties may defer.

Technical Specification:

Color: Light grey Swelling volume: 28 ml per 100 ml Dispersion rate: High Plate water absorption: 545% pH: 7-9 Moisture: 10% to 11%

Chemical Analysis:

Silica as SiO_2 : 28% to 43% Alumina as Al_2O_3 : 18% to 32% Iron as Fe_2O_3 : 4% to 11% Calcium as Ca: 1% to 3% Carbon as C: 10% to 14% Copper as Cu: 3% to 5%

Physical & Chemical Properties:

State: Solid powder 75 mesh Color: Light grey Odor: Odorless Solubility: Insoluble in water Viscosity: Non viscous Relative density: 1890-1990 kg/m³





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DOKSUN POWER PRIVATE LIMITED

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