Kumwell

Grounding & Lightning Protection System

TOTAL SOLUTIONS

Product Guide

GROUNDING PROTECTION

LIGHTNING PROTECTION

EXOTHERMIC WELDING

SURGE PROTECTIVE DEVICE

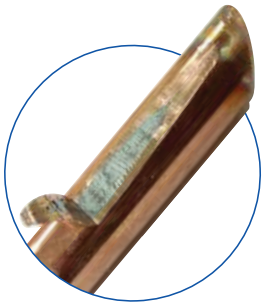
Copper-bonded Ground Rod

Kumwell Copper-Bonded Ground Rods meet the requirements of the rigorous standard-UL. The copper layer whose minimum thickness is 254 micron met the UL standard.

Standard size diameters commonly used are 1/2”, 5/8”, 3/4”, and 1”.
Standard lengths commonly used are 4’ to 10’.
Thread type ground rods are available to extend the length of ground rods by using coupling.

Kumwell Intensive Test and Inspection of Ground Rod
Ground Rods should pass the following criterions of international standards as shown;

Thickness Inspection
Copper shell of each ground rod shall pass the thickness inspection to ensure its protective coating.
The copper shell shall not be less than 0.254 mm (254 micron) thick at any point to meet UL 467 standard.

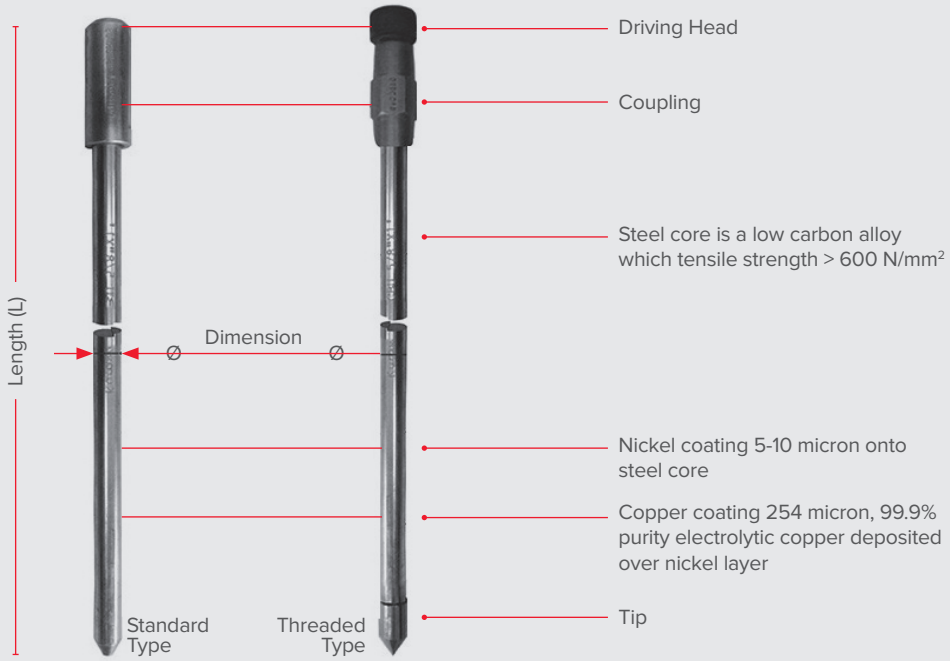


Adherence of Coating Test
There shall be no separation of the coating from the steel core when subjected to the test described to meet UL 467 standard requirements.
Peeling of the coating by the steel plates or the jaws of the vise shall be allowed.

Bending Strength Test
There shall be no cracking of the coating when subjected to the test to meet UL 467 standard requirements.
The application of force shall be such that the rod is permanently bent through a 30° angle.

Straightness Test
Ground rod should be passed straightness test to ensure its straightness and high tensile with acceptable sag. The deviation of every 305 mm ground rod shall be less than 3.05 mm.

Kumwell Copper-Bonded Ground Rod is made by special progress, molecular bonding pure electrolytic coating of copper 99.9% deposited over a layer of nickel, onto a low carbon, with high tensile steel core 600 N/mm^2 and ensurer a longer life span.



Grounding Protection System

The proper selection of grounding system has significant implications for the safety and protection of building structure, a functional ground system serves a purpose other than protecting people and property against electrical shock but also carry current during the normal operation of a device such as surge suppression and electromagnetic compatibility setback.

- Long life
- High resistance to corrosion
- Low resistance path to ground
- Ability to carry high currents
- Cost effective

Ground Rods

Catalog No.	Description
GRCBU 5810	Copper Bonded (Unthreaded) 5/8” x 10ft
GRCBU 3410	Copper Bonded (Unthreaded) 3/4” x 10ft
GRCBUT 5810	Copper Bonded (Threaded) 5/8” x 10ft
GRCBUT 3410	Copper Bonded Threaded) 3/4” x 10ft
GRCBH 110B	Copper Bonded, 1” Ø x 10ft Standard series, (100 micron)
GRGA 5810	Hot dipped galvanized. 5/8” Ø x 10ft. (100 micron)

Ground Rod Coupling

Catalog No.	Description
GRBCO 58	High strength silicone bronze (Threaded) 5/8” Ø
GRBCO 34	High strength silicone bronze (Threaded) 3/4” Ø

Ground Rod Driving Head

Catalog No.	Description
GRDSR 58	Zinc plated steel, 5/8” for Unthreaded ground rod
GRDSR 34	Zinc plated steel, 3/4” for Unthreaded ground rod
GRBDH 58	High tensile steel, 5/8” for Threaded ground rod
GRBDH 34	High tensile steel, 3/4” for Threaded ground rod

Hammer Driving Ground Rod

Catalog No.	Description
GHSD-1500-12	Hammer slide driving ground rod set Prove rod- Black steek pipe; Hammer- Mild steel

Inspection Pit

Catalog No.	Description
GXCIP	Concrete 320 x 320 x190 mm, compressive strength 6000kg
GXPIP	Fiber Reinforced Polyester 320 x 320 x 190 mm, compressive strength 2000kg
GXFIP	Fiber Reinforced Polyester 320 x 320 x 90 mm, compressive strength 5000kg
GXCIP-WS	Stainless steel 300 x 300 x 2 mm

Grounding Test Box

Catalog No.	Description
GYATB	Aluminum box copper connection bar (16-120 mm^2) 198 x 148 x 98 mm
GYPTB	ABS copper connection bar (16-120 mm^2) 200 x 150 x 100 mm

Disconnecting Link

Catalog No.	Description
GBDL-253	Aluminum box copper connection bar (16-120 mm^2) 198 x 148 x 98 mm

Earth Point

Catalog No.	Description
GXEP 120 (2)	Copper Alloy BSEN 1982, 2-Holes, 35-120 mm^2
GXEP 120 (4)	Copper Alloy BSEN 1982, 4-Holes, 35-120 mm^2
GYSER 663	Copper Alloy BSEN 1982

Ground Clamp

Catalog No.	Description
GXC 142-70	Copper Alloy BSEN 1982, 16-70 mm^2 to 5/8” Ø
GXC 172-95	Copper Alloy BSEN 1982, 35-95 mm^2 to 3/4” Ø
GXC 231-120	Copper Alloy BSEN 1982, 70-120 mm^2 to 1” Ø
GXCC 172-150	Copper Alloy BSEN 1982, 3/4” Ø to 70-150 mm^2 cable
GXCC 142-95	Copper Alloy BSEN 1982, 14.2 mm Ø to 16-95 mm^2 cable
GXCT 142-302	Copper Alloy BSEN 1982, 5/8” x 14.2 mm
GXCT 172-2610	Copper Alloy BSEN 1982, 3/4” x 17.2 mm
GXCTH 172-70	Copper Alloy BSEN 1982, 5/8-3/4” Ø to Cable 3 x 25-70 mm^2

Cable Clamp

Catalog No.	Description
GXCTW 172-70	Copper Alloy BSEN 1982, 5/8-3/4”Ø to Cable 2 x 25-70 mm^2
LGRC-A	Copper Alloy BSEN 1982, 95-120 mm^2
LGRC-B	Copper Alloy BSEN 1982, 150-185 mm^2
GXPCP1-50-95	Copper Alloy BSEN 1982, (25-95 mm^2) to Pipe (1-1/4 -2”Ø)

Cable Clamp for Flat Bar

Catalog No.	Description
GXCCF-G2P	Copper Alloy BSEN 1982, 70-120 mm
GXCCP-G2P	Copper Alloy BSEN 1982, 95-120 mm^2

More Effective Grounding

Catalog No.	Description
GRMEG-25LBS	Soil Conditioning Agent, 25 lbs / 11.5 kg / bag 0.01 Ω.m resistivity

Ground Station

Catalog No.	Description
GBPGSS-6	Copper Alloy BSEN 1982, 70-120 mm
GBPGSS-6D	Copper Alloy BSEN 1982, 95-120 mm^2

Lightning Protection System

Kumwell Lightning Protection products are in accordance to international standards:
IEC 62305 - Protection against lightning
BS 6651 - Code of practice for protection of structures against lightning
NFPA 780 - Standard for the installation of Lightning Protection System
UL 96 - Lightning protection components

Air Terminal

Catalog No.	Description
LTATT-58-50	Taper Point, Copper Alloy BSEN 13601, 5/8”Ø x 500 mm
LTATT-58-100	Taper Point, Copper Alloy BSEN 13601, 5/8”Ø x 1000 mm
LTATT 34-60	Taper Point, Copper Alloy BSEN 13601, 3/4”Ø x 600 mm
LTATT-34-100	Taper Point, Copper Alloy BSEN 13601, 3/4”Ø x 1000 mm
LMAT-34	Multi Point, Copper Alloy BSEN 13601, 3/4”

Air Terminal Bases (Saddles)

Catalog No.	Description
LROS-58	Round Saddle Copper Alloy BSEN 1982, 5/8”Ø
LROS-58-C4/0	Round Saddle Copper Alloy BSEN 1982, 5/8”Ø 4/0 awg
LROS-34	Round Saddle Copper Alloy BSEN 1982, 3/4”Ø
LDOS 58	Double Saddle Copper Alloy BSEN 1982, 5/8”Ø (25-70 mm^2)
LDOS 58 C4/0	Double Saddle Copper Alloy BSEN 1982, 5/8”Ø (25-100 mm^2) 4/0awg
LDOS 34 C4/0	Double Saddle Copper Alloy BSEN 1982, 3/4”Ø 4/0awg
LDAS 58	Adjustable Saddle 5/8”Ø (25-120mm^2)

Strike Pad

Catalog No.	Description
AS-SPTSC-S383	Aluminum Alloy BS 2898, 112 mm Ø
AS-SPRSA-S383	Copper Alloy BS 2898, 112 mm Ø

Cable Support

Catalog No.	Description
LCAS 50-70	Copper Alloy BSEN 1982, 50-70 mm^2
LCAS 95-120	Copper Alloy BSEN 1982, 95-120 mm^2

One Hole Cable Grip

Catalog No.	Description
LOCG 25-35	Copper Alloy BSEN 13601, 25-35 mm
LOCG 50-70	Copper Alloy BSEN 13601, 50-70 mm
LOCG 95-120	Copper Alloy BSEN 13601, 95-120 mm

Clamp

Catalog No.	Description
LTEC - B	Tee Clamp, Copper Alloy BSEN 13601, 95-120 mm^2
LBC 35-120	Beam Clamp, Copper Alloy BSEN 13601, 35-120 mm^2
LOCG 35-70	Cable Cross Clamp, Copper Alloy BSEN 13601, 35-70 mm^2
LOCG 95-120	Cable Cross Clamp, Copper Alloy BSEN 13601, 95-120 mm^2

C Clamp

Catalog No.	Description
CCC 120-120	C-Clamp, Copper Alloy BSEN 13601, Run-120mm^2 Tap-120mm^2

Surge Protective Device (SPD)

Surges or transients are an over-voltage spikes or disturbances on a power wave that can damage, degrade or destroy electronic equipment in industrial, commercial building and manufacturing facilities.

Two Types of Over-Voltages

- Transient over-voltage (switching operation direct and indirect atmosphere discharge)
- Temporary over-voltage (TOV)

Kumwell SPD's products are designed, researched and developed according to International Standard (IEC 61643) and VDE certification from Germany.

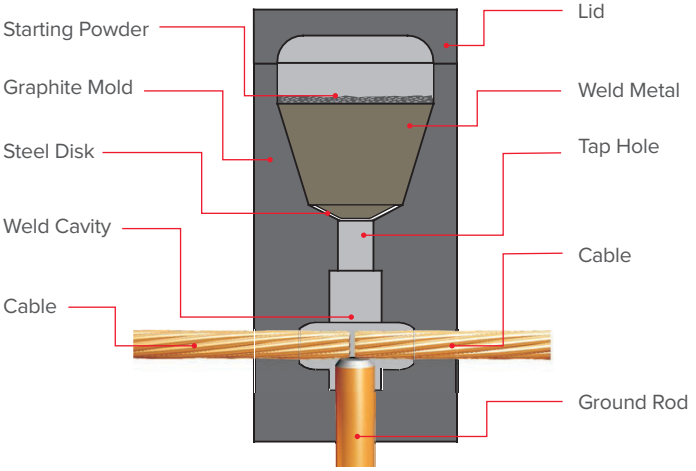
Exothermic Welding

Grounding Connection

There are several main objectives providing for well-designed grounding system: first, personal safety, followed by equipment protection, signal reference quality, return path for faults and surges and static dissipation.

Process

Kumwell Exothermic Welding process is a molecular chemical reaction between copper oxide and aluminum that generates a tremendous superheat with molten metals reaching temperatures up to 4,000°F (2600°C). The process can be completed itself automatically without external source of power heat.



The process use finely divided aluminum particles as the reducing agent with copper oxide to produce the chemical reaction.

$$3CuO + 2Al \longrightarrow 3\,Cu + Al_2O_3$$

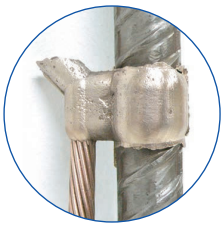
Exothermic Welding

Starting and weld metal powder

- Non toxic and heavy metal
- Non self-ignite
- Ignition temperature at least 400°C
- Smooth reaction

Mould

- Earnest design: cavity, flow path
- High quality raw material
- Accurate tolerance
- Duration: at least 50 times in normal usage



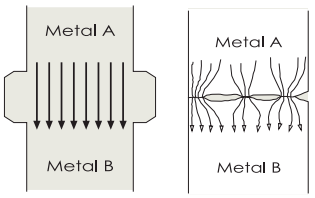
• 95 mm² Copper Cable to 40mm Rebar

Welding Metal

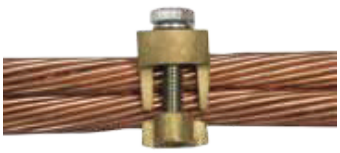
- Non toxic and heavy metal
- Steady burn without pop and fire out
- No slag and porosity
- Consistency of color
- High conductivity with at least 93% Cu

Technical comparison

Exothermic welding withstands about 5 times higher than clamp's connection in mechanical force. Unlike compression and bolt clamp, exothermic welded joint become a homogeneous metal.



Exothermic Welding
3000 lbf



Clamp
500 lbf

Maximum result of connector's mechanical force with 70 mm² cable

Standard

Criteria of Test

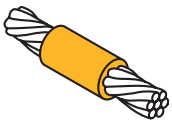
Kumwell Exothermic welding connections have been succesfully tested in accordance with

IEEE Std. 837 Standard for Qualifying Permanent Connection

1. Mechanical pullout
2. Electromagnetic force
3. Sequential test group has 3 main procedures to test each steps if it passes the set standard of each procedure
   a. Current temperature Cycling
   b. Freeze thaw Cycling
   c. Corrosion Sequence Run: Salt Spray Test, Acid Test

UL 467 Standard for Grounding & Bonding Equipment/ UL Inspection Witness

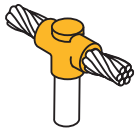
1. Weld metal powder quality: Percentage of material, Particle size, Density of each composition, Starting powder and ignition
2. Reaction: Steady burn, No pop, No drastic color change, No porosity in the resulting copper, Consistency of color
3. Short Time Current Test
4. Mechanical Sequence from UL 486


Horizontal Cable End to End


Horizontal Tap to Horizontal Run


Horizontal to Horizontal Cable Cross


Horizontal Cable to Ground Rod


Horizontal Thru Cable to Ground Rod


Horizontal Cable Cross to Ground Rod


Angular Cable Drop to Vertical Steel Surface


Graphite Mould


Weld Metal Powder Type KW


Handle Clamp Type C

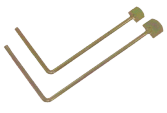

Chain support "X" for Handle Clamp


Vertical Beam Support "Y" Handle Clamp


Mould Brush

Tool Box


Cable Clean Brush


Mould Scraper


Butane Torch


Flint Gun


Busbar Brush

Kumwell

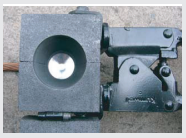
Exothermic Welding Process

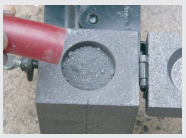

1. Assemble mould with handle clamp


2. Preheat by butane torch to ensure the mould is totally dry


3. Clean the surface of conductor and rod by cable clean brush and preheadt by butane torch to ensure the cindustor is totally dry


4. Fit conductors and ground rod snugly into the mould and lock the handle clamp. Always make sure the mould is in a level position.

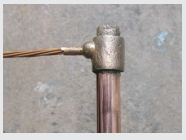

5. Place retaining disk ensuring the disk sits well at the base of the weld metal cavity


6. Pour a recommended size of weld metal into the mould crucible. Check for leaks of weld metal. Repeat step 4 in case of leak

7. Loosen starting powder from the bottom of tube. Pour 2/3 of it on top of the weld metal and the mouth of mould lid marked "x"

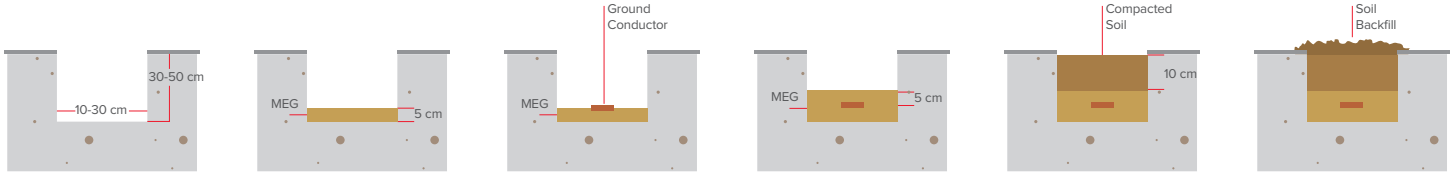
8. Ignite the starting powder at the lid opening by flint gun
The process takes 3.-60 seconds


9. Gently rub slag from the crucible by scraper
Clean the crucible and weld cavity by mould cleaning brush to endure the mould


10. Complete connection

More Effective Grounding Installation

Horizontal Installation

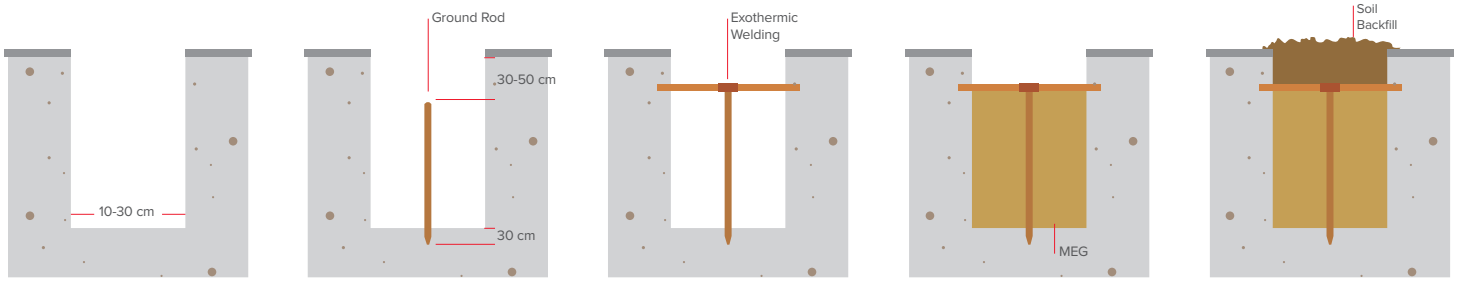


1. Mix MEG into a slurry form, by using a standard cement mixer or bucket. Use 10 to 14 liters of clean water per 25lbs. bag MEG.
2. Spreading MEG to uniformly cover bottom of trench about 2.5cm thickness. Let the MEG harden about 15 -20 minutes to prevent the conductor from sinking to the bottom of the trench.
3. Place conductor on top of MEG.
4. Spreading more MEG on top of conductor to completely cover conductor about 2.5 cm (thickness). Allow MEG to harden about one hour before filling the trench with compacted soil.
5. Carefully cover the MEG with soil, making sure not to expose the conductor.

Estimated trench length per bag (MEG 25lbs)

Trench Width	MEG THICKNESS	
	5 cm (2 inches)	10 cm (4 inches)
10 cm (4 inches)	4 m	2 m
15 cm (6 inches)	2.7 m	1.3 m
20 cm (8 inches)	2 m	1 m
25 cm (10 inches)	1.6 m	0.8 m
30 cm (12 inches)	1.3 m	0.7 m

Vertical Installation



1. Auger a 10 cm or larger diameter hole.
2. Place ground rod into center of augered hole and drive 30 cm (if possible) into bottom of the hole. The tip of the ground rod will be approximately 30 cm to 50 cm below grade.
3. Make connections to ground rod using exothermic welding.
4. Premix MEG into a slurry form. Use 10 to 14 liters of clean water per 25lbs. bag of MEG . Then pour the appropriate amount of MEG around the ground rod. To ensure the MEG material completely fills the hole, stamp around the ground rod. Wait about 1 hour before filling the hole with soil backfill.
5. Fill remainder of augered hole with soil which removed during augering.

Estimated trench length per bag (MEG 25lbs)

MEG Hole Diameter	MEG Hole Depth
10 cm (4 inches)	2.5 m
15 cm (6 inches)	1.1 m
20 cm (8 inches)	0.6 m
25 cm (10 inches)	0.4 m
30 cm (12 inches)	0.3 m

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