



# HEXWELD

## EXOTHERMIC WELDING

History in Engineering eXcellence

# HEXWELD EXOTHERMIC WELDING

## INTRODUCTION

### SECTION 1: INTRODUCTION

HEXWELD Exothermic welding is a simple, cost effective process used for joining similar metals like copper to copper & dissimilar metals like copper to steel. Unlike other type of joints or connections like mechanical or compression, an exothermic weld forms a permanent, irreversible joint. The homogenous nature of this joint after cooling, ensures that all the components are fused together in a single mass. This ensures a joint of the highest quality which is the key factor required for a safe & reliable electrical connection.

The HEXWELD Exothermic welding process employs an aluminothermic reaction of a copper thermite composition to heat the weld metal. Simply put, this process involves a chemical reaction that releases heat and requires no external source of heat.

This reaction takes place within a graphite mould which is specific to the type of joint required. The weld powder when ignited by using the flint gun, flows in a molten state through the mould and over and around the components to be welded, forming a superior, electrically conductive weld between them.

#### **Advantages of HEXWELD exothermically welded connections :**

- Due to the fused homogenous connection, they maintain a lower resistance over time.
- Due to a limited susceptibility to corrosion, they will not deteriorate with age.
- Usually, the life span of the weld exceeds that of the components it connects.
- The molecular bonding eliminates any risk of loosening.
- Will withstand repeated fault currents & offers the lowest possible earth path resistance.
- A visual inspection of the joint will ensure quick quality control.
- Safe and easy to use with minimal training and protective equipment.
- Conforms to the requirements of IEEE 837.

## SECTION 2: TOOLS REQUIRED FOR EXOTHERMIC WELDING

### 1) Graphite Mould

Our Graphite moulds are made of high-quality graphite and are designed to last for an average of 60 connections. This will vary according to the care given to the mould during use. We recommend not using the mould for more than 70 joints as the weld cavity size increases after every joint, eventually making the weld cavity shape improper.



### 2) Mould Handle Clamp (Universal)

For most connections involving lugs, cables or rectangular bus, Mould handle clamps are used. These are suitable for 90% of all standard exothermic moulds. Normally we recommend one Handle Clamp for every two moulds.



### 3) Steel Metal Disk

The Steel metal disk is a very important component & is mandatory for every joint. The disk acts as a timing device to allow the weld powder to heat to the required temperature. It then melts away, allowing the molten copper to flow into the joint cavity.



### 4) Exothermic Weld Powder

This is supplied in moisture-resistant plastic cartridges with special closure caps.

Standard packing sizes available are – 150 grams, 200 grams & 250 grams.

Each cartridge consists of the Weld Metal Powder + Starting/Ignition Powder. The weld metal powder is at the top & the Starting powder / Ignition Powder is at the bottom of the cartridge.



### 5) Ignition Powder / Starting Powder

Ignition Powder also known as Starting Powder is required to start the exothermic reaction. Pour a little on the Weld Metal Powder and again pour a little on the igniting hole/slot provided in the Mould lid. Ignite it with a Flint Gun.

This resulting exothermic reaction reduces the weld powder to molten copper alloy. The molten copper alloy melts the retaining steel disk and flows into the weld cavity where it partially melts the conductors. Ignition Powder of 5 grams is sufficient for this process.



### 6) Gloves

High temperature resistant Gloves are an integral part of the HEXWELD kit & are required for the safety of the operators as the molten metal reaches temperatures in excess of 1400 degree Celcius (2550 degree F).



### 7) Flint Gun

It is designed with the advantages of safety and convenience & is used to ignite the Starting Powder which results in the exothermic reaction. We recommend one Flint Gun for every 100 Shots.



### 8) Brushes (Soft and Hard)

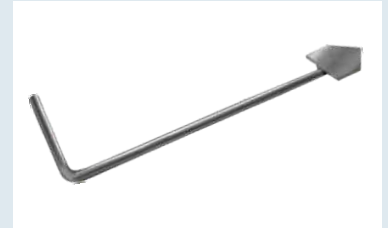
Soft Brush – It is used to clean the Mould weld cavity so as not to damage its critical shape.

Hard Brush – It is used to clean other sections of the Mould.

We recommend a pair of Brushes for 50 joints.

### 9) Slag Removal Tool

It is used to remove the unwanted slag from the Mould.



### 10) File Card

It is used to clean the objects to be welded.

### 11) Sealing Compound

Sealing Compound is used to fill the gaps on the mould where the components to be welded are inserted.



### SECTION 3: THE HEXWELD PROCESS

STEP - 1 : Always wear protective safety glasses and gloves while working with HEXWELD exothermic welding products.

STEP - 2 : Gather all the proper material and equipment/accessories for the type of connection you are making. The requirements of a typical HEXWELD system are given in Section 2. Check to ensure the graphite mould is not worn or broken, which could cause leakage of molten weld metal.



STEP - 3 : Slide the handle clamp into the pre-drilled holes of the Mould with the proper orientation for the thumbscrews.

STEP - 4 : Tighten the clamp thumbscrews onto the mould.

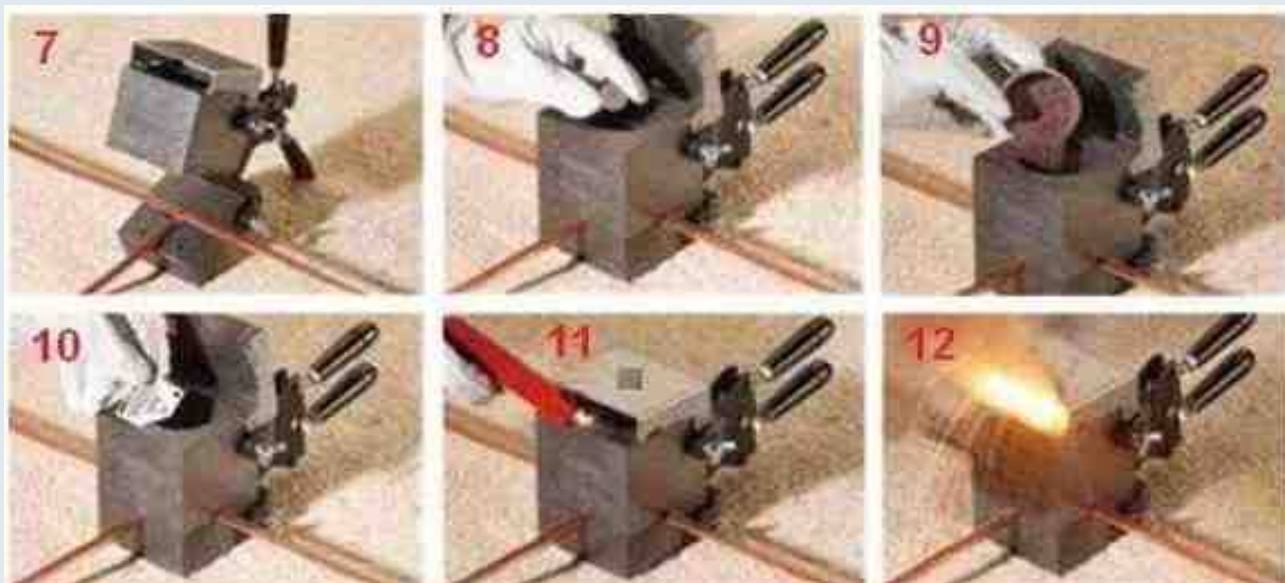
STEP - 5 : Close the grips to tightly lock the mold. Make adjustments to tighten/loosen the handle clamp.

STEP - 6 : The components to be welded (cable, rod, tape) must be dried & cleaned using the brush included in the set of accessories. Thus, the oxide layer and superficial impurities are eliminated. Given that the graphite mould also absorbs moisture, this should be removed by preheating with a gas welding torch to avoid a porous weld. After the first weld is done, it is not necessary to re-heat the mould if the next weld is done within 15 minutes as it conserves the previously generated heat.

STEP - 7 : Place the components into the mould and close the handle clamps tightly. Please note that if there is even a minor gap, apply Sealing Compound at the places where the components are inserted into the mould, else at the time of welding, the weld metal will spread out as a flame resulting in an improper joint

STEP - 8 : Insert the Steel Metal disk (concave side up) into the Mould by holding it on the side of the mould cavity & let it slip into place. Ensure that it blocks the path to the joint cavity.

STEP - 9 : Open the Weld Metal Cartridge & pour the loose powder into the Mould.



STEP - 10 : Tap the bottom of the cartridge & loosen the compressed Igniting / Starting Powder. Empty 50% of this powder over the Weld Metal Powder (don't mix, just scatter). Close the lid of the Mould and then pour the remaining Starting Powder on the hole/slot given on the Lid of the Mould.

STEP - 11 : Ignite the Starting Powder using the Flint Gun.

STEP - 12 : Once started, the reaction will take 3-4 seconds during which it is recommended to stand clear of the Mould. Allow a minute or two for completion of the reaction & solidification of the molten metal inside the Mould.

STEP - 13 : Open the Mould by undoing the handle grip. Remove the Mould from the joint and clean the joint for any slag. Once open, clean the slag sticking to the Mould with the relevant tool and clean the cavities. Care must be taken to ensure that the Mould does not get chipped during cleaning. The Mould will be ready now to make another HEXWELD without having to reheat it as it is already warm.



**Note :**

We recommend the use of minimum two Moulds on site to keep the process continuous. While one Mould is cooled and cleaned after firing, the other should be used. The task should be undertaken very peacefully and one should not hurry, keeping safety foremost in mind.

## **GENERAL & SAFETY INSTRUCTIONS :**

- Only those equipment and materials specified in the instruction sheets should be used to make weld connections.
- Failure to comply with these instructions may result in improper and unsafe weld joints, damage to items being welded, to equipment & property or even injury to body.
- Do not use worn or broken equipment which could cause leakage. Sealing compound should be used in case of fine leakages.
- Do not use welding material if the package is damaged or not fully intact.
- Personnel should be properly trained and must wear safety glasses and gloves.
- Avoid any contact with hot materials.
- Advise all other personnel to stand at least 10 feet away from the site of welding operations.
- All inflammable material must be removed or enclosed properly from the operation site to safeguard against fire hazards.
- The area of welding operations should be adequately ventilated.
- Smoking in the area of welding operations must be totally prohibited.
- Avoid direct eye contact with “flash” of light from ignition of starting material.
- Welding material is an exothermic mixture and reacts to produce hot molten material with temperatures in excess of 1400°C (2550°F) and a localized release of smoke. Ignition temperatures are in excess of 900°C (1650°F) for welding material. These materials are not explosive.
- Adhering to all safety norms for welding procedures will minimize risk of burns and fire caused by hot molten material spillage. In case of fire, use of water or CO2 will aid in control of burning containers. Large quantities of water will aid in controlling a fire should the exothermic materials become involved. Water should be sprayed from a distance.
- All governing codes and regulations and those rules required by the job site must be observed. Always use appropriate safety equipment such as eye protection, hard hat and gloves.

## **WARNING :**




































- Products shall be installed and used only as indicated in product instruction sheets.
- Products must never be used for a purpose other than the purpose for which they were designed or in a manner that exceeds specified load ratings.
- All instructions must be completely followed to ensure proper and safe installation and performance.
- Improper installation, misuse, misapplication or other failure to comply with instructions and warnings may cause bad weld joint, property damage or even serious body injuries.

## **MAINTENANCE & STORAGE INSTRUCTIONS :**

























- A Mould is usually good for 50 - 60 connections in field conditions.
- The Moulds are fragile and should be handled carefully while in use.
- Cleaning of Moulds should be done using appropriate brush / tool only after the Mould is reasonably cooled down after a weld operation. Cleaning of hot Moulds must be avoided.
- Cleaning the cavity of the Mould should be carefully done by trained personnel only, to avoid damages or chipping.
- On completion of all welds, the Mould should be cleaned thoroughly from inside and outside using a soft cloth. It should be wrapped in bubble plastic sheet & stored in a safe place.
- The Moulds and the weld powder should always be stored in a cool & dry place.
- All tools and accessories must also be cleaned before storing them.

# MOULD SELECTION CHARTS





















## 1) Cable to Cable Connections (HWCC)

|  |  |  |  |  |
|--|--|--|--|--|
| HWCC – 1<br>    | HWCC – 2<br>    | HWCC – 3<br>    | HWCC – 4<br>     | HWCC – 5<br>    |
| HWCC – 6<br>    | HWCC – 7<br>    | HWCC – 8<br>    | HWCC – 9<br>     | HWCC – 10<br>   |
| HWCC – 11<br>   | HWCC – 12<br>   | HWCC – 13<br>   | HWCC – 14<br>   | HWCC – 15<br>   |
| HWCC – 16<br> | HWCC – 17<br> | HWCC – 18<br> | HWCC – 19<br> | HWCC – 20<br> |
| HWCC – 21<br> | HWCC – 22<br> | HWCC – 23<br> | HWCC – 24<br>  | HWCC – 25<br> |
| HWCC – 26<br> | HWCC – 27<br> | HWCC – 28<br> | HWCC – 29<br> | HWCC – 30<br> |
| HWCC – 31<br> | HWCC – 32<br> | HWCC – 33<br> | HWCC – 34<br>  | HWCC – 35<br> |




























## 2) Cable to Ground Rod Connections (HWCR)

|  |  |  |  |  |
|--|--|--|--|--|
| HWCR – 1<br>    | HWCR – 2<br>    | HWCR – 3<br>    | HWCR – 4<br>     | HWCR – 5<br>    |
| HWCR – 6<br>    | HWCR – 7<br>    | HWCR – 8<br>    | HWCR – 9<br>     | HWCR – 10<br>   |
| HWCR – 11<br>   | HWCR – 12<br>   | HWCR – 13<br>   | HWCR – 14<br>   | HWCR – 15<br>   |
| HWCR – 16<br> | HWCR – 17<br> | HWCR – 18<br> | HWCR – 19<br>  | HWCR – 20<br> |
| HWCR – 21<br> | HWCR – 22<br> | HWCR – 23<br> | HWCR – 24<br>  | HWCR – 25<br> |
| HWCR – 26<br> | HWCR – 27<br> | HWCR – 28<br> | HWCR – 29<br> | HWCR – 30<br> |
| HWCR – 31<br> | HWCR – 32<br> | HWCR – 33<br> | HWCR – 34<br> |  |




















### 3) Cable to Lug / Tape Connections (HWCT)

|  |  |  |  |  |
|--|--|--|--|--|
| HWCT – 1<br>    | HWCT – 2<br>    | HWCT – 3<br>    | HWCT – 4<br>     | HWCT – 5<br>    |
| HWCT – 6<br>    | HWCT – 7<br>    | HWCT – 8<br>    | HWCT – 9<br>     | HWCT – 10<br>   |
| HWCT – 11<br>   | HWCT – 12<br>   | HWCT – 13<br>   | HWCT – 14<br>   | HWCT – 15<br>   |
| HWCT – 16<br> | HWCT – 17<br> | HWCT – 18<br> | HWCT – 19<br>  | HWCT – 20<br> |
| HWCT – 21<br> | HWCT – 22<br> | HWCT – 23<br> | HWCT – 24<br> | HWCT – 25<br> |
| HWCT – 26<br> | HWCT – 27<br> | HWCT – 28<br> | HWCT – 29<br> | HWCT – 30<br> |
| HWCT – 31<br> | HWCT – 32<br> | HWCT – 33<br> | HWCT – 34<br>  | HWCT – 35<br> |










#### 4) Cable to Steel Surface/Pipe Connections (HWCS)

|   |   |   |   |   |
|---|---|---|---|---|
| <p><b>HWCS – 1</b></p>     | <p><b>HWCS – 2</b></p>     | <p><b>HWCS – 3</b></p>     | <p><b>HWCS – 4</b></p>     | <p><b>HWCS – 5</b></p>     |
| <p><b>HWCS – 6</b></p>     | <p><b>HWCS – 7</b></p>     | <p><b>HWCS – 8</b></p>     | <p><b>HWCS – 9</b></p>      | <p><b>HWCS – 10</b></p>    |
| <p><b>HWCS – 11</b></p>   | <p><b>HWCS – 12</b></p>   | <p><b>HWCS – 13</b></p>   | <p><b>HWCS – 14</b></p>    | <p><b>HWCS – 15</b></p>   |
| <p><b>HWCS – 16</b></p>  | <p><b>HWCS – 17</b></p>  | <p><b>HWCS – 18</b></p>  | <p><b>HWCS – 19</b></p>   | <p><b>HWCS – 20</b></p>  |
| <p><b>HWCS – 21</b></p>  | <p><b>HWCS – 22</b></p>  | <p><b>HWCS – 23</b></p>  | <p><b>HWCS – 24</b></p>  | <p><b>HWCS – 25</b></p>  |
| <p><b>HWCS – 26</b></p>  | <p><b>HWCS – 27</b></p>  |   |   |   |












### 5) Lug / Tape to Steel Surface Connections (HWTS)

|  |  |  |  |   |
|--|--|--|--|---|
| HWTS – 1<br>    | HWTS – 2<br>    | HWTS – 3<br>    | HWTS – 4<br>     | HWTS – 5<br>   |
| HWTS – 6<br>    | HWTS – 7<br>    | HWTS – 8<br>    | HWTS – 9<br>     | HWTS – 10<br>  |
| HWTS – 11<br>  | HWTS – 12<br>  | HWTS – 13<br>  | HWTS – 14<br>   | HWTS – 15<br> |
| HWTS – 16<br> | HWTS – 17<br> | HWTS – 18<br> | HWTS – 19<br> |   |




















### 6) Rod/Stud to Steel Surface Connections (HWRS)

|  |   |   |   |   |
|--|---|---|---|---|
| HWRS – 11<br> | HWRS – 2<br> | HWRS – 3<br> | HWRS – 4<br>  | HWRS – 5<br> |
| HWRS – 6<br>  | HWRS – 7<br> | HWRS – 8<br> | HWRS – 9<br> |   |

















## 7) Ground Rod to Ground Rod Connections (HWRR)

|  |   |   |   |  |
|--|---|---|---|--|
| HWRR - 1<br>  | HWRR - 2<br> | HWRR - 3<br> | HWRR - 4<br> | HWRR - 5<br>  |
| HWRR - 6<br>  | HWRR - 7<br> | HWRR - 8<br> | HWRR - 9<br>  | HWRR - 10<br> |
| HWRR - 11<br> |   |   |   |  |







## 8) Ground Rod to Tape Connections (HWRT)

|  |  |  |  |  |
|--|--|--|--|--|
| HWRT - 1<br>  | HWRT - 2<br>  | HWRT - 3<br>  | HWRT - 4<br>   | HWRT - 5<br>  |
| HWRT - 6<br>  | HWRT - 7<br>  | HWRT - 8<br>  | HWRT - 9<br>   | HWRT - 10<br> |
| HWRT - 11<br> | HWRT - 12<br> | HWRT - 13<br> | HWRT - 14<br> | HWRT - 15<br> |
| HWRT - 16<br> | HWRT - 17<br> | HWRT - 18<br> | HWRT - 19<br>  |  |

### 9) Cable to Re-Bar Connections (HWCB)

|  |  |  |  |  |
|--|--|--|--|--|
| HWCB – 1<br>    | HWCB – 2<br>    | HWCB – 3<br>    | HWCB – 4<br>     | HWCB – 5<br>    |
| HWCB – 6<br>    | HWCB – 7<br>    | HWCB – 8<br>    | HWCB – 9<br>     | HWCB – 10<br>   |
| HWCB – 11<br>   | HWCB – 12<br>   | HWCB – 13<br>   | HWCB – 14<br>    | HWCB – 15<br>   |
| HWCB – 16<br> | HWCB – 17<br> | HWCB – 18<br> | HWCB – 19<br> | HWCB – 20<br> |
| HWCB – 21<br> | HWCB – 22<br> |  |  |  |

### 10) Tape to Tape Connections (HWTT)

|   |   |   |  |   |
|---|---|---|--|---|
| HWTT – 1<br> | HWTT – 2<br> | HWTT – 3<br> | HWTT – 4<br> | HWTT – 5<br> |
| HWTT – 6<br> |   |   |  |   |

### 11) Tape to Re-Bar Connections (HWTB)

|  |  |  |   |   |
|--|--|--|---|---|
| <p><b>HWTB – 1</b></p>    | <p><b>HWTB – 2</b></p>    | <p><b>HWTB – 3</b></p>  | <p><b>HWTB – 4</b></p>  | <p><b>HWTB – 5</b></p>   |
| <p><b>HWTB – 6</b></p>    | <p><b>HWTB – 7</b></p>    | <p><b>HWTB – 8</b></p>  | <p><b>HWTB – 9</b></p>  | <p><b>HWTB – 10</b></p>  |
| <p><b>HWTB – 11</b></p>  | <p><b>HWTB – 12</b></p>  |  |   |   |

### 12) Re-Bar to Re-Bar Connections (HWBB)

|  |  |  |   |
|--|--|--|---|
| <p><b>HWBB – 1</b></p>  | <p><b>HWBB – 2</b></p>  | <p><b>HWBB – 3</b></p>  | <p><b>HWBB – 4</b></p>  |
|--|--|--|---|

### 13) Rod to Re-Bar Connections (HWRB)

|  |  |
|--|--|
| <p><b>HWRB – 1</b></p>  | <p><b>HWRB – 2</b></p>  |
|--|--|



## **BRASS COPPER & ALLOY (I) LTD.**

# 15, Mehta Mahal, 2nd Floor, Mathew Road, Charni Road (E), Mumbai - 400 004.

Tel. : +91 22 4095 0000, 6671 0997/8/9 | E-mail : [hexindia@hexworldwide.com](mailto:hexindia@hexworldwide.com)

**[www.hexworldwide.com](http://www.hexworldwide.com)**