

UltraShot Exothermic Training

Presented by

HARGER[®]

Grounding - Exothermic - Lightning Protection

Manufacturer of

ULTRAWELD[®]



Exothermic Training Outline

- 1 • What is an Exothermic Welded Connection
- 2 • Benefits of Exothermic Welded Connections
- 3 • Required Tools
- 4 • Welding Preparation
- 5 • Connection Process
- 6 • Inspection Process
- 7 • Types of Exothermic Connections
- 8 • Common Obstacles
- 9 • Productivity Enhancing Tools





What is an Exothermic Welded Connection?



EXOTHERMICS: THE ULTRAWELD PROCESS



What is an Exothermic Welded Connection?

- An exothermic reaction is a chemical reaction in which heat is liberated
- An exothermic reaction provides the heat necessary to make a molecular connection between 2 or more metal conductors such as copper and copper, or copper and steel





What is an Exothermic Welded Connection?

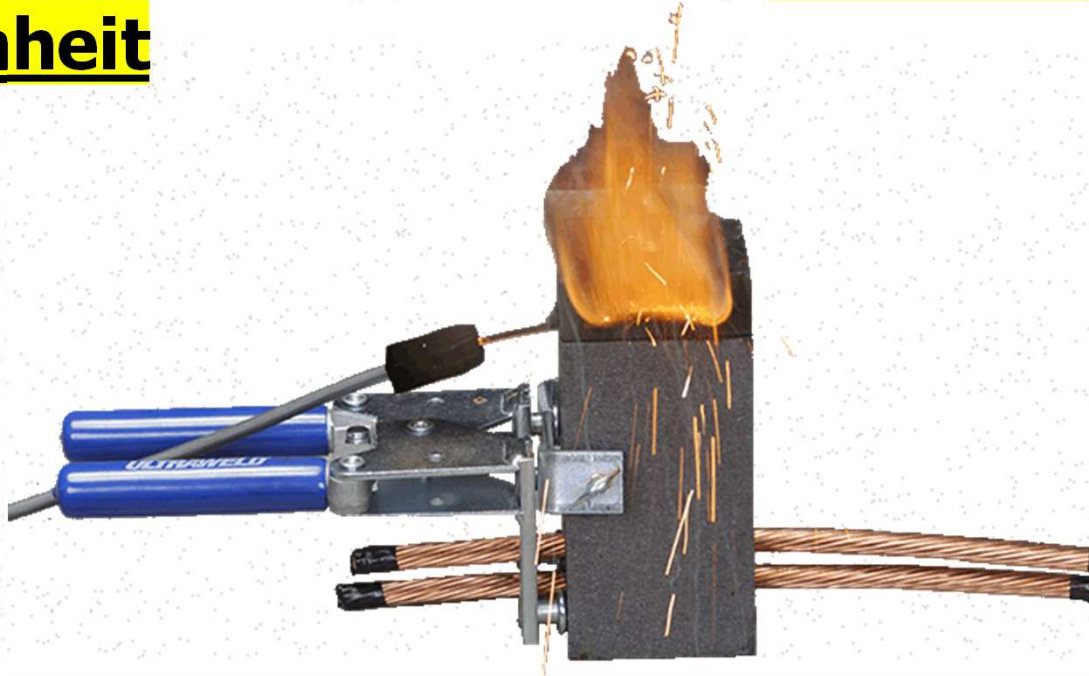
- An Ultraweld connection is made using the reaction between copper oxide and aluminum
- The molten copper drops down in the mold and melts the conductors together in a molecular bond





What is an Exothermic Welded Connection?

- This reaction takes place in a graphite mold and reaches a temperature of approximately **4,600 degrees Fahrenheit**



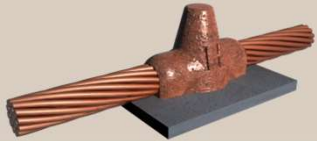
Benefits

- Exothermic connections have features and benefits that are unique when compared to other types of connections
- Benefits Include:
 - Ampacity exceeds that of the conductors
 - Will not loosen over time
 - No increase in resistance over time
 - Lasts longer than the conductors it connects
 - Maintenance free
 - **Permanent!**



Making an Exothermic Welded Connection

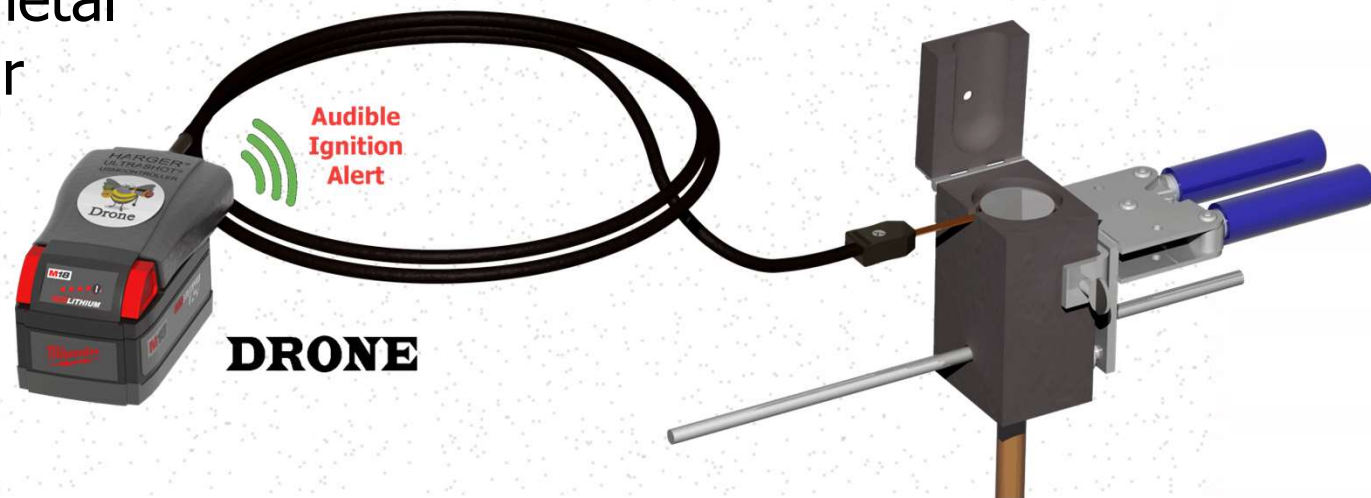
Exothermic Connections
90% Preparation
10% Execution



Required Tools

4 Main Components to the exothermic system

- Mold
- Handle
- UltraShot weld metal
- DRONE controller



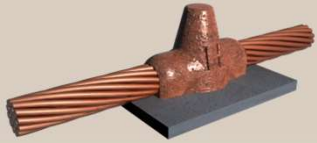


Required Tools - Molds

Mold

- Made of Graphite, does wear with use
- Traditionally average 50 welds with tube style weld metal
- Using UltraShot, extends mold life as much as **5 times**
- Proper care and cleaning extends mold life.

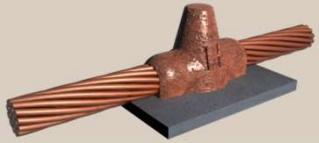




Required Tools - Molds

- Mold Information
 - Enhanced mold tag
 - Box Label
 - Verify this information matches your application



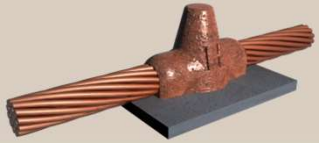


Required Tools - Molds

Activities reducing mold life

- **DO NOT** use a **wire brush** to clean mold
- **DO NOT** use a screw driver to clean the mold
- **DO NOT** push conductor into a closed mold
- **NOT pre-heating the mold prior to initial use**



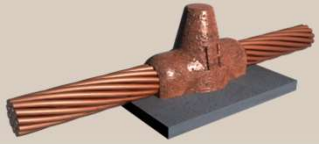


Required Tools - Molds

Mold

- Horizontal vs Vertical split
- Combo



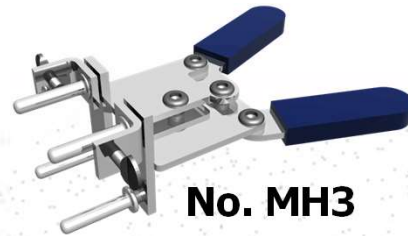


Required Tools - Handles

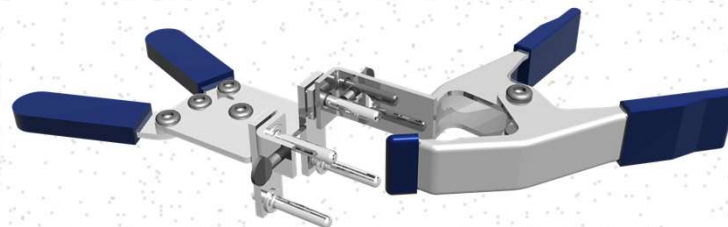
Handles



No. MH1/MH2



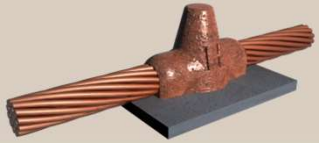
No. MH3



No. MH4



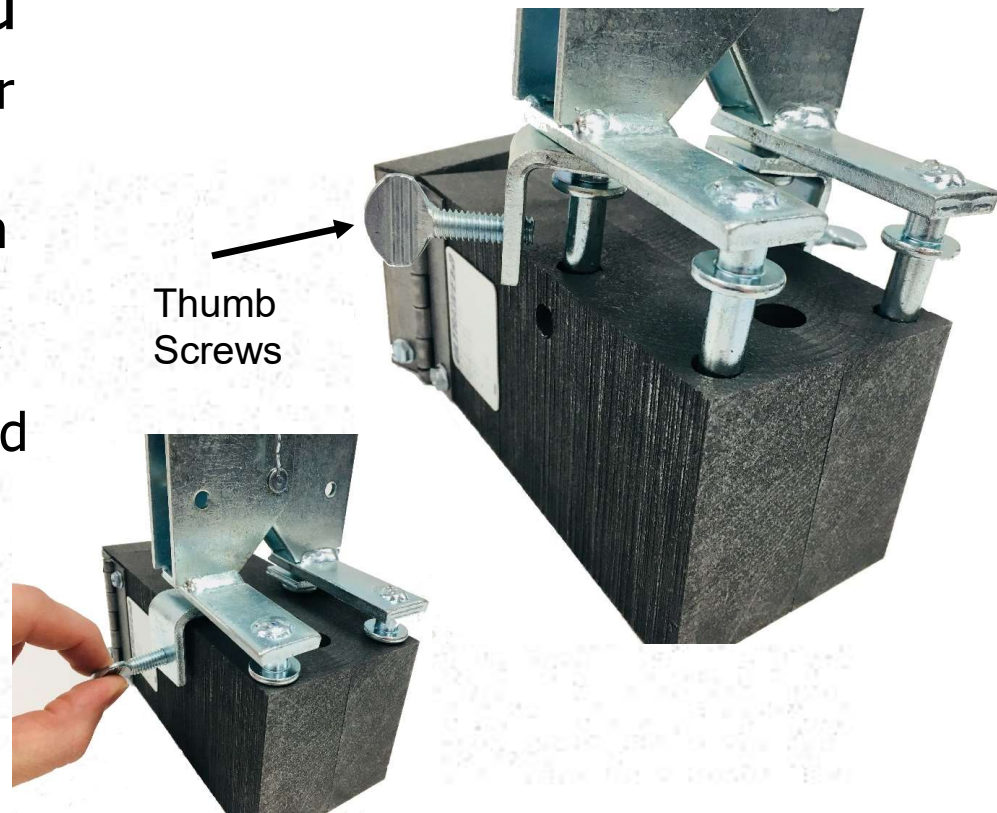
No. MH6/MH7

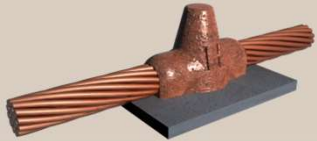


Required Tools - Handles

Install the Proper Handles in Mold

- Make sure the handles clear the conductor holes
- Tighten thumb screws into button holes in mold
- Lock handles closed, they will “snap shut” and make sure all mold surfaces are closed





Required Tools – UltraShot

UltraShot

- Different sizes
 - Based on amount needed for specific connection
 - **Size matters!**
- Benefits of UltraShot
 - Increased productivity, twice as fast as tube style weld metal
 - Extends mold life by as much as **5 times**



UltraShot® (Drop-In) Weld Metal

Size	Qty. Per Carton	Size	Qty. Per Carton
US25	20	US200	10
US32	20	US250	10
US45	20	US300	10
US65	20	US400	5
US90	10	US500	5
US115	10	US600	5
US150	10	US750	5



Required Tools – DRONE

DRONE

- Drone ignites UltraShot® copper drop-in weld metal cartridges that are consumed in the exothermic connections
- A Drone using a fully charged Milwaukee battery will ignite between **1,100-1,500 connections** on a single charge





Required Tools – DRONE

DRONE

- Safer
 - **2 button safety feature**
 - 6 foot ignition cord
 - Audible and visual ignition indicators
 - Ignites in approximately 1 second





Making an Exothermic Welded Connection

Exothermic Connections
90% Preparation
10% Execution

Welding Preparation

Safety First!

- Follow all procedures and warnings on the instruction sheets
- **Glasses and gloves are to be used at all times**
- **Arms should be covered and any loose clothing should be secured**





Required Tools – Preparation & Cleaning

- Preparation and cleaning tools
 - Cable and surface cleaning brushes
 - Mold Cleaning brush
 - Soft bristle brush
 - Torch for pre-heating mold



Cable Cleaning Brush
Part# CCBRS2



Mold Cleaning Brush
Part# MCBRS1



Cable Cleaning Brush
Part# CCBRS1



For Pre-Heating Mold
Part # TRCHD
Map gas not included

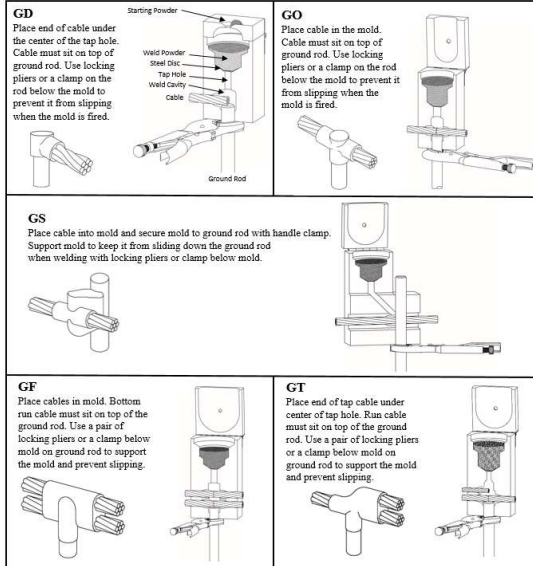


Welding Preparation

HARGER

ULTRAWELD®

INSTRUCTIONS FOR ULTRAWELD® GROUNDING CONNECTIONS - CABLE TO GROUND ROD



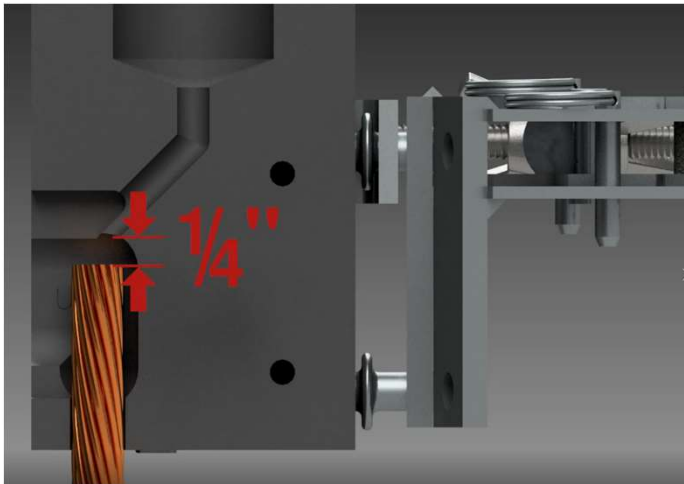
Revised 1/3/2014

Visit our website at www.harger.com for further tips and videos.

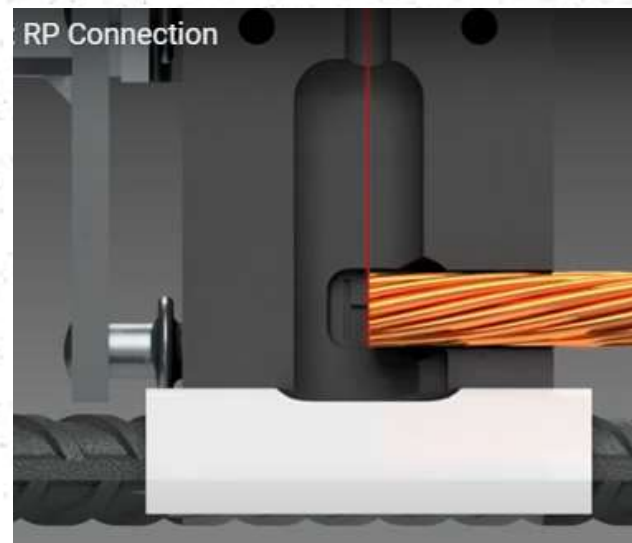
- All molds include an instruction sheet
- **Read all instructions included with the mold**
- **Instruction videos also on mold tag – QR code**
- Be sure to note the position of the conductors in the mold



Welding Preparation

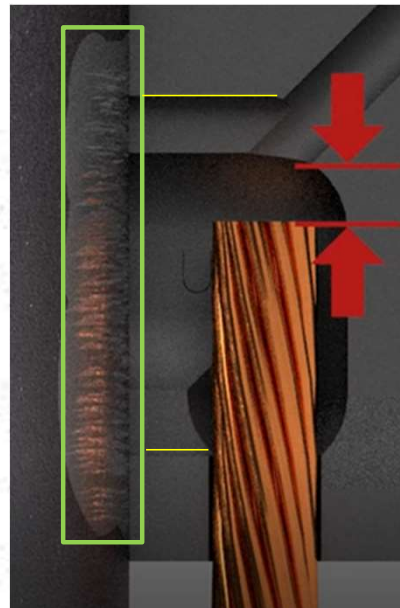


- Instructions/Videos
 - Conductor placement is key to making a good weld.





Welding Preparation

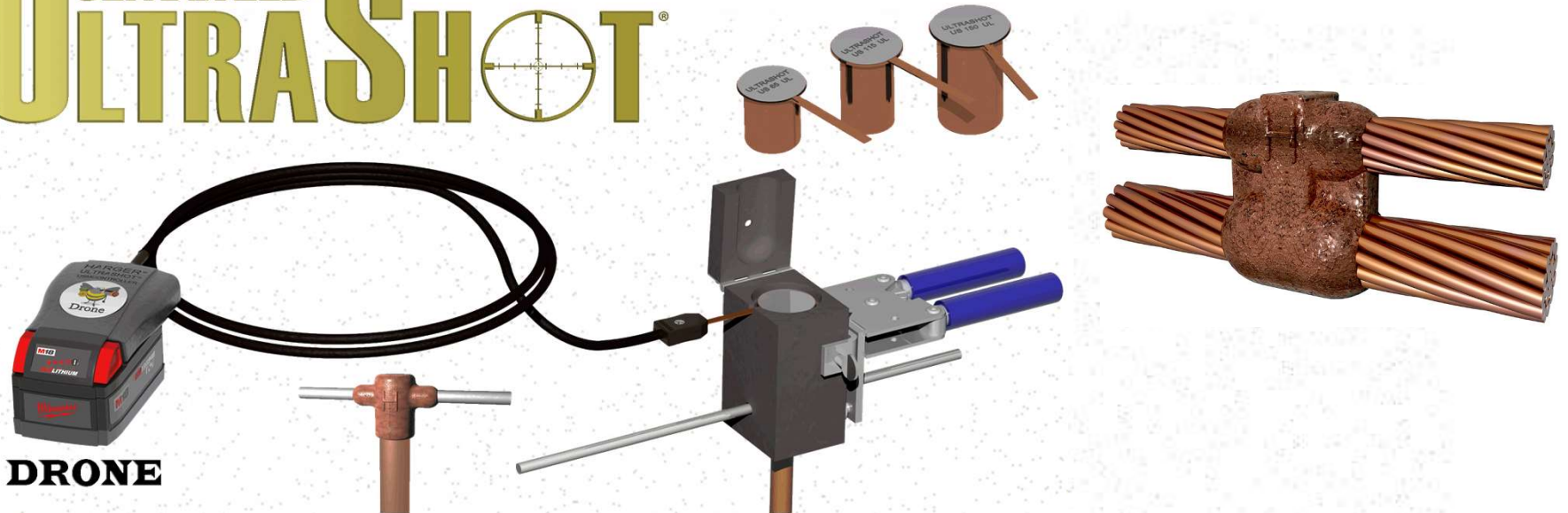


- Welds to steel require all galvanizing, paint, or other coatings to be removed
- **Exothermic connections will not stick to galvanized surfaces!**

Connection Process

UltraShot is 2x Faster than Traditional Pour and Shoot!

ULTRAWELD
ULTRASHOT®



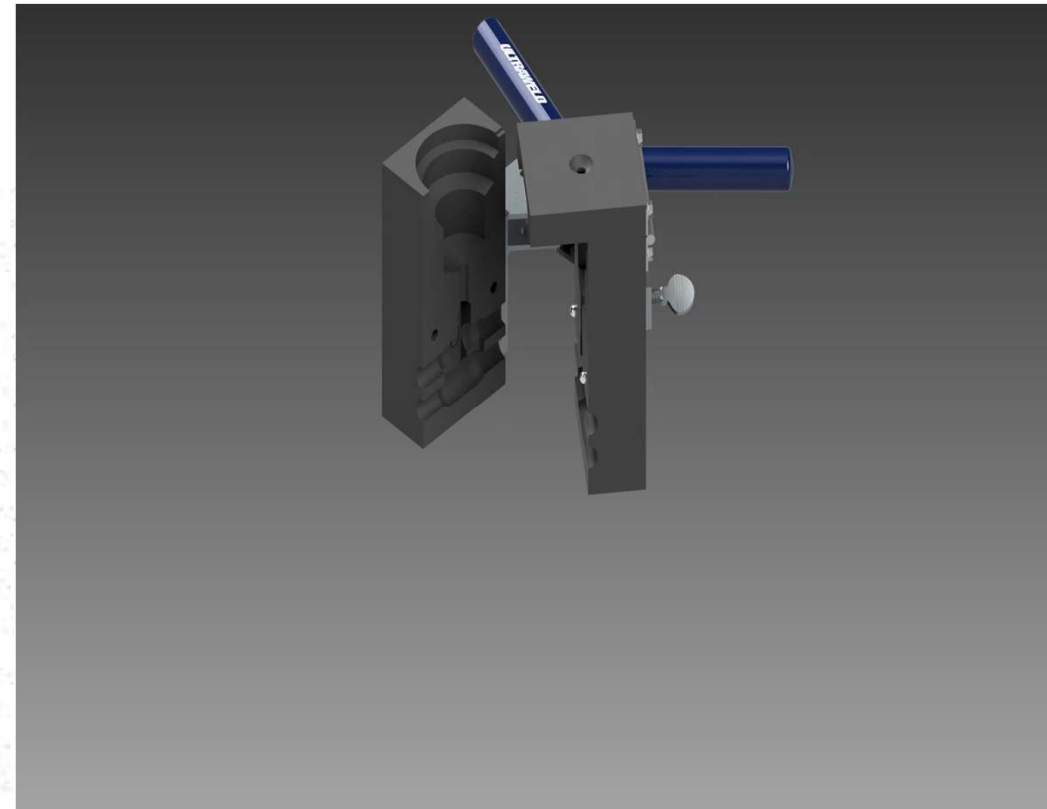
Note – UltraShot connections are safer than traditional “Pour and Shoot” methods



Connection Process

Step 1

- Dry and clean the mold and conductor to eliminate moisture
 - **The mold needs to be dried before the first weld of the day** or if the mold has sat for an extended period time in between welds.

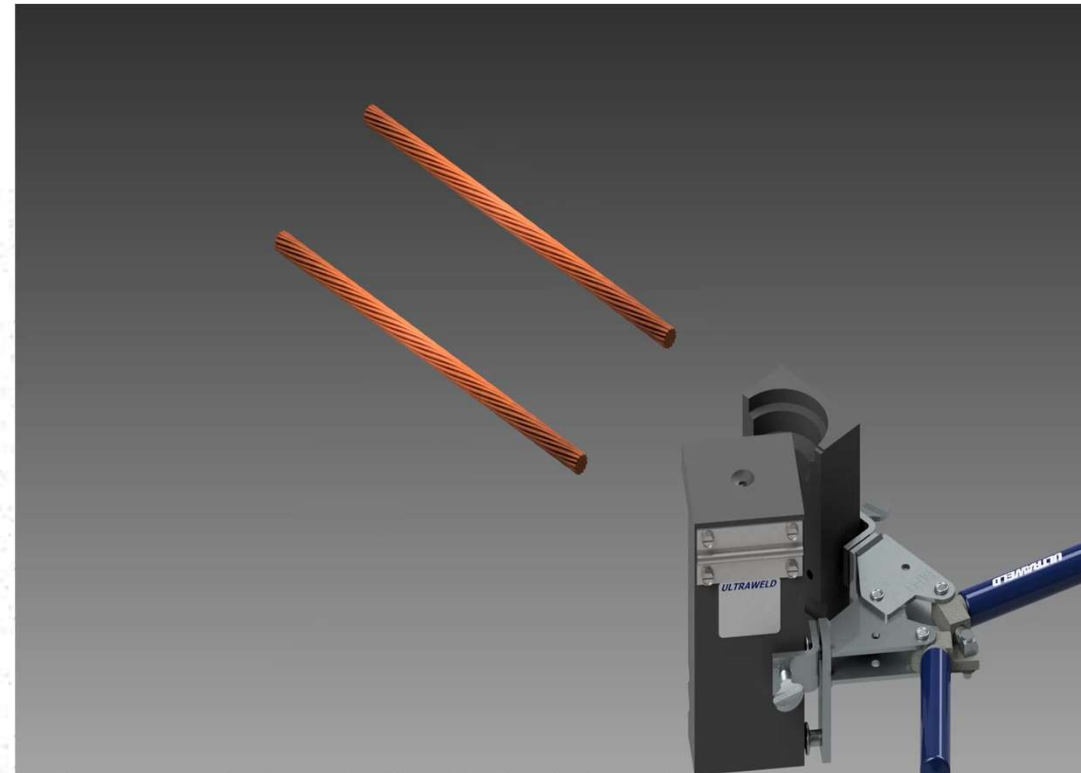




Connection Process

Step 2

- Place the conductors into the mold and close
 - **Inspect the parting line of the mold verifying the mold is completely closed and that there are no gaps**
 - **Make sure all components involved in the welding process are supported to ensure they do not move**

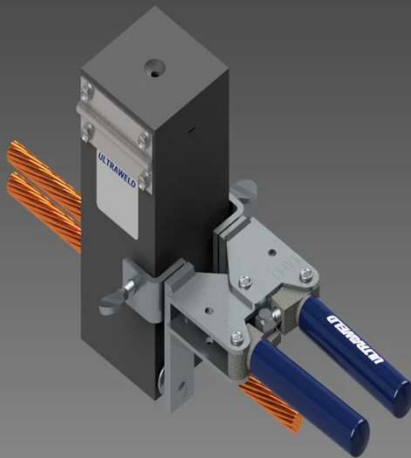




Connection Process

Step 3

- Insert US cartridge into mold, close the lid and attach the Drone's cord to the cartridge igniter
 - Make sure the igniter is inserted fully into igniter tip.

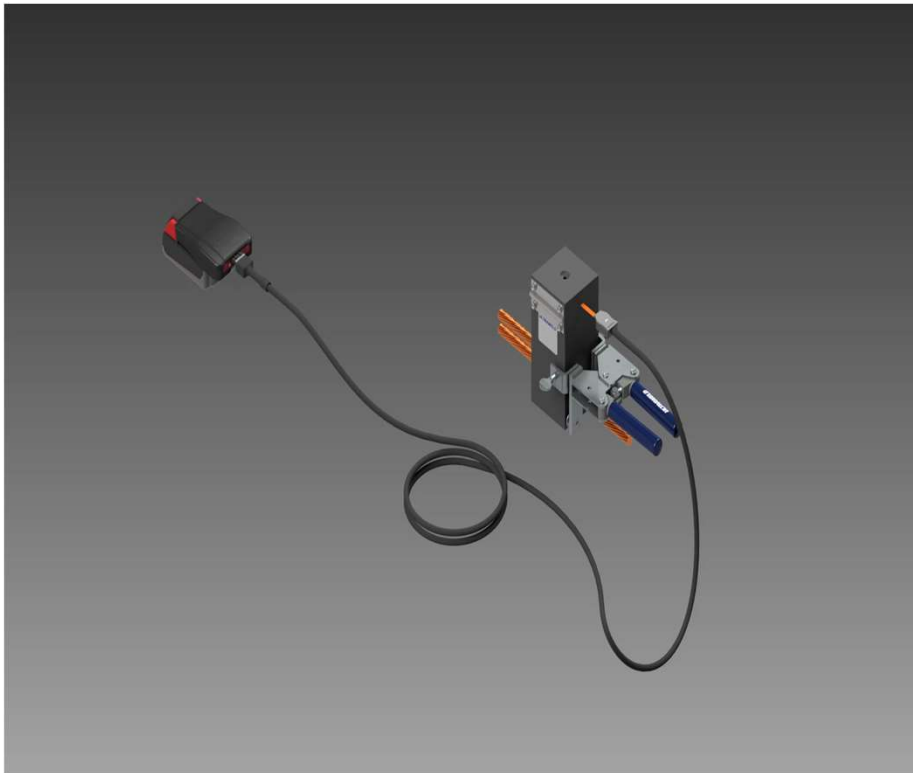


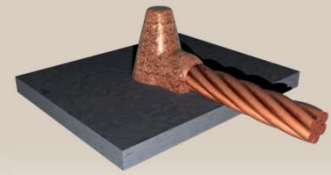


Connection Process

Step 4

- Start the reaction process by pressing **both buttons** on the controller
- Release buttons as soon as you hear the audible alert and see the reaction take place
- Approximately 1 second to fire after buttons are depressed

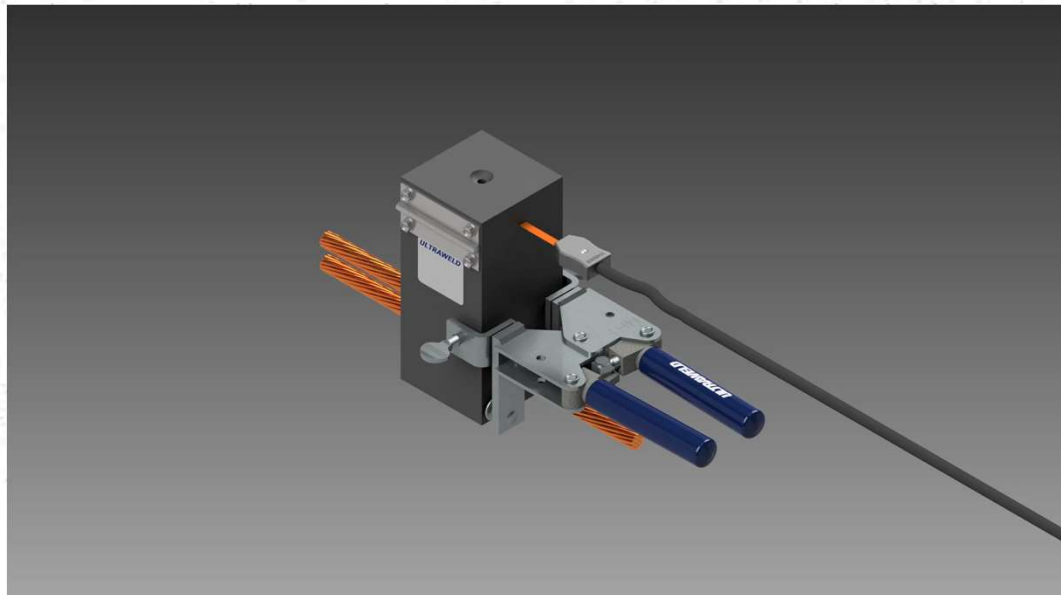




Connection Process

Step 5

- Allow 15-20 seconds for the reaction to complete
- Open the mold and remove the connection and **clean the mold prior to the next use**

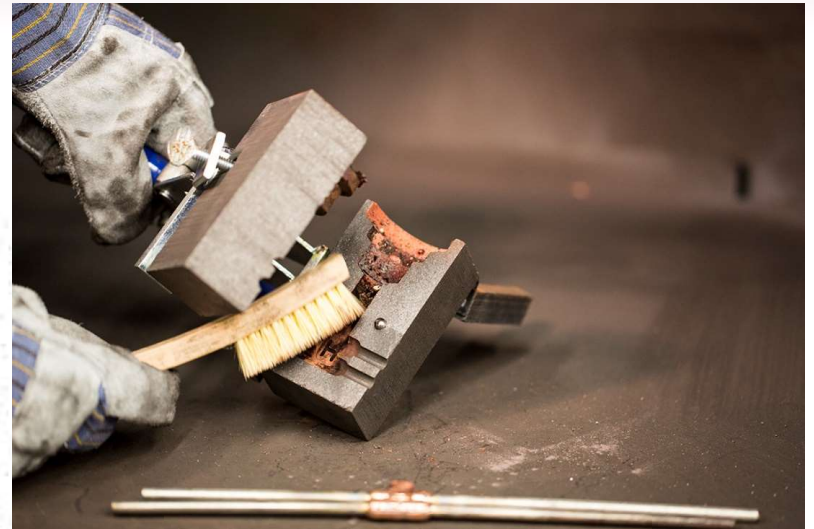


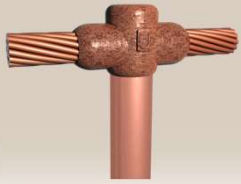


Required Tools – Preparation & Cleaning

Cleaning the mold

- Soft bristle mold cleaning brush to clean slag and residue from the mold
- **DO NOT use a steel brush**





The Inspection Process Exothermic Molds





The Inspection Process Exothermic Connections



EXOTHERMICS: WELD INSPECTION



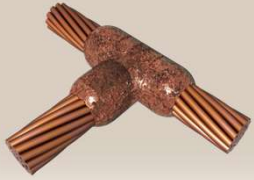


The Inspection Process Exothermic Connections

Not enough weld metal

- Wrong cartridge used



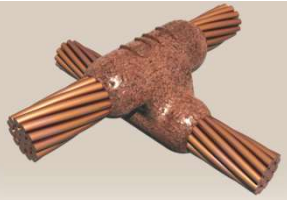


The Inspection Process Exothermic Connections

Leakage and Excessive slag

- Mold not closed properly
- **Connections must contain less than 20% slag**





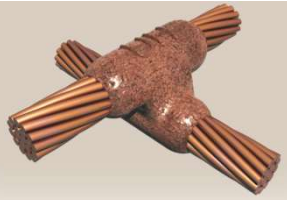
The Inspection Process

Exothermic Connections

Gassy weld

- Conductor or mold not properly cleaned and dried
- Contaminant on mold or conductor

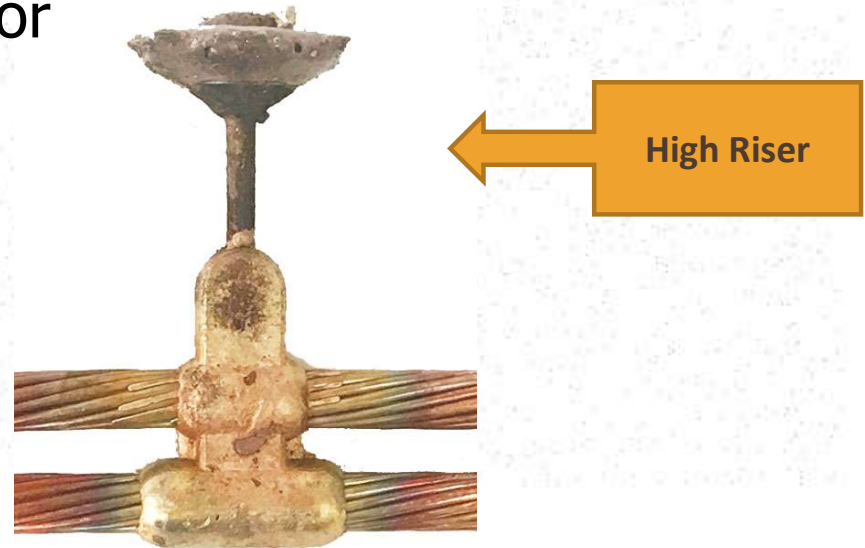




The Inspection Process Exothermic Connections

High Riser

- Too large of a shot used
- Conductor or mold not properly cleaned and dried
- Contaminant on mold or conductor

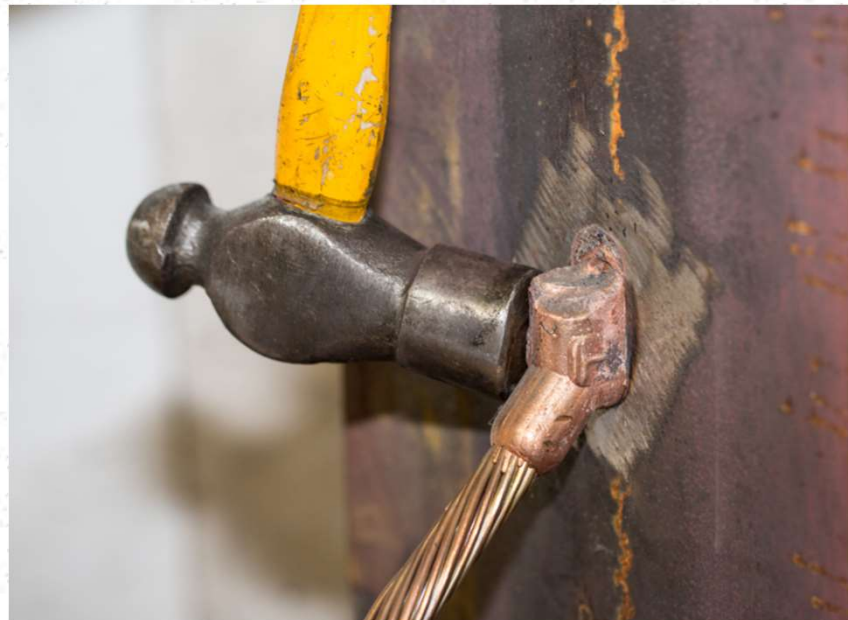




The Inspection Process Exothermic Connections

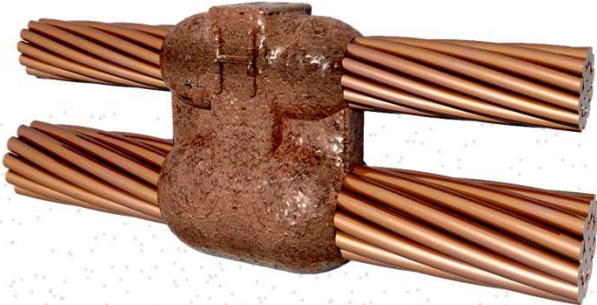
Hammer test for welds to steel

- Tap weld with hammer without damaging conductor or weld, to verify adhesion to steel

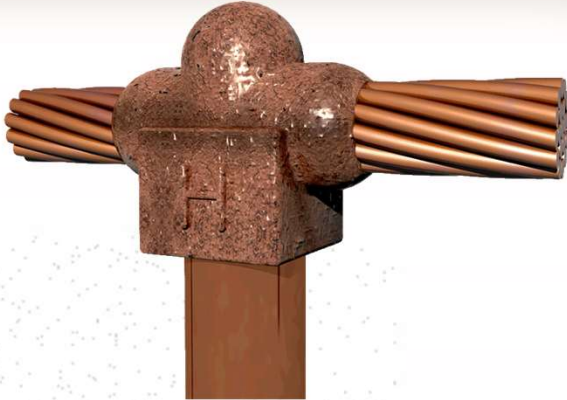


Types of Connections

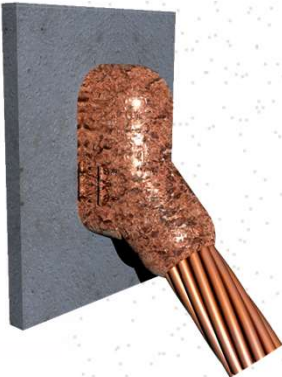
- Some common weld types



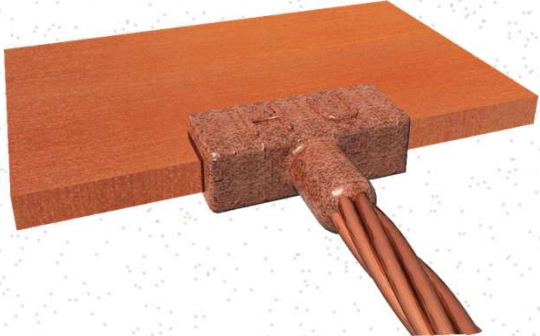
PT Style Connection



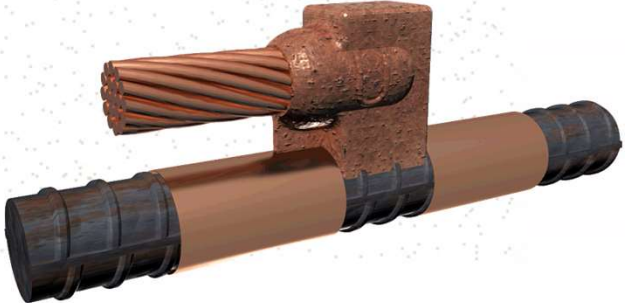
GO Style Connection



VA Style Connection



BE Style Connection



RP Style Connection



Making an Exothermic Welded Connection

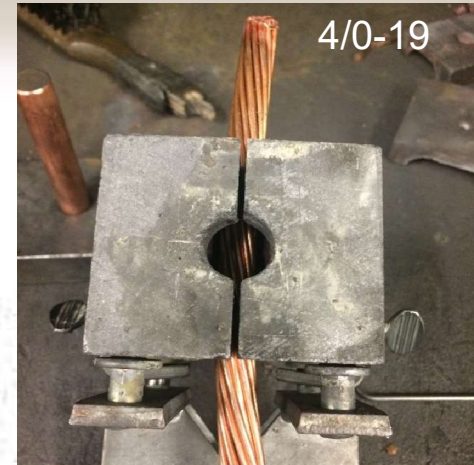
Exothermic Connections

90% Preparation

10% Execution

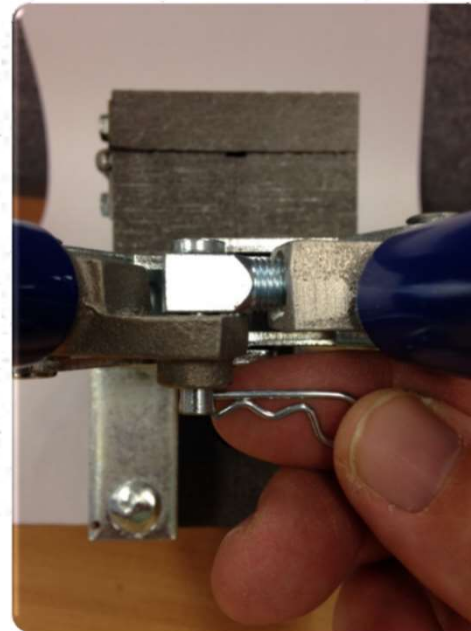
Common Obstacles

- Mold does not close all the way
 - Dirt, slag or other material in mold
 - Bent or out of round conductors in mold
 - Handle clamp out of adjustment
 - Wrong mold for the application



Common Obstacles

- Handle clamp adjustment:
 - Pull hair pin and clevis pin
 - Turn eye bolt to counterclockwise tighten and clockwise to loosen clamp
 - Replace clevis pin and hair pin and double check the closure of the mold



Common Obstacles

- Ultrashot did not fire
 - Check that battery is charged
 - Ensure igniter is fully inserted into plug, $\frac{3}{4}$ "



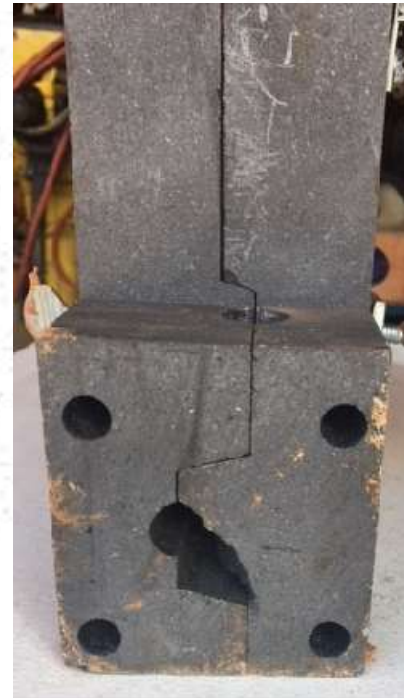
Common Obstacles

- Weld cavity underfills
 - Wrong size weld metal used
 - Mold leaked
 - Incorrect mold for application



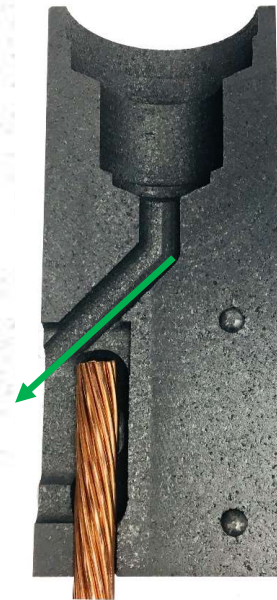
Common Obstacles

- GS Mold breaks during removal
 - Use care when removing, don't tilt and open all the way



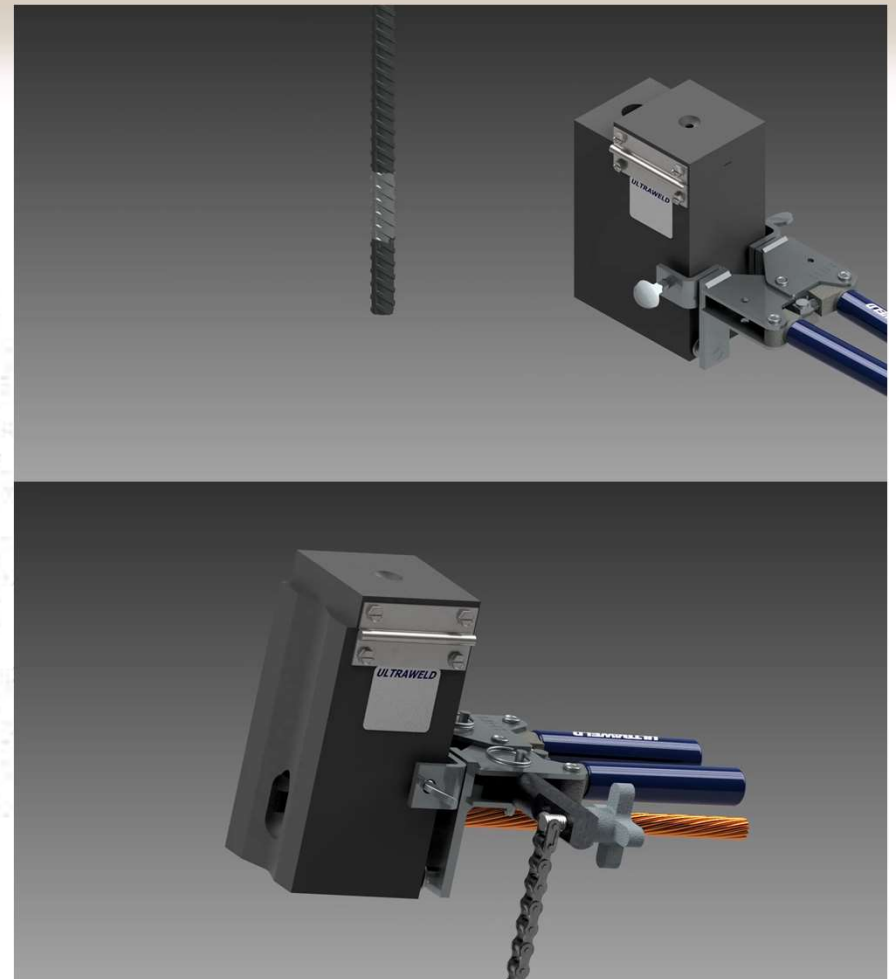
Common Obstacles

- Connection not sticking to Steel Surface
 - Completely remove all coating and oxide on surface **including galvanizing**
 - Must be ground down to bare steel
 - Cable not in mold according to instructions



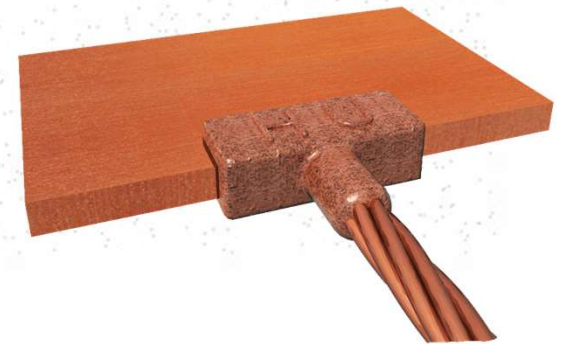
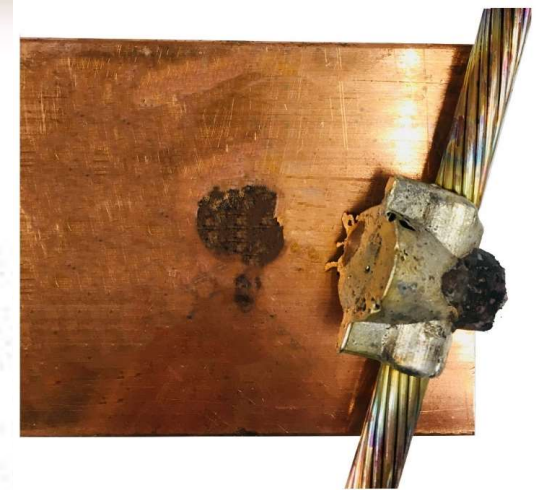
Common Obstacles

- Connection not sticking reinforcing steel
 - Completely remove all coating and oxide on surface
 - Must be ground down to bare steel
 - Sleeve or packing pad placement



Common Obstacles

- Connection not sticking to Busbar
 - Weld to the edge of the bar
 - Pre-heat the bar (do not use a torch directly on the location of the weld)
 - Clean the spot on the busbar to be welded to remove any oxide



Common Obstacles

- Burn thru on thin material
 - Verify on extra piece it will not burn through
 - On fence post, fill the post with sand to a level above the connection area



Common Obstacles

- Melt thru on cable to ground rod
 - Verify conductor is not under tension, support if required
 - Support mold on ground rod with a pair of locking pliers so mold doesn't drop during welding



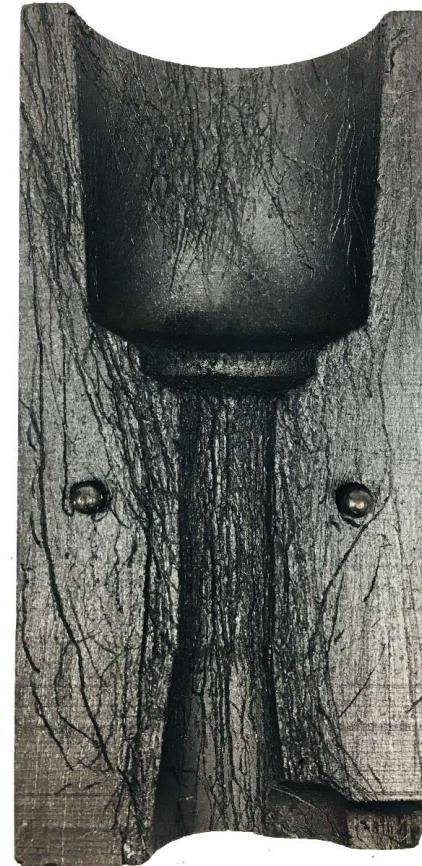
Common Obstacles

- Leakage and Excessive Slag
 - Mold not closed
 - **Connections must contain less than 20% slag**



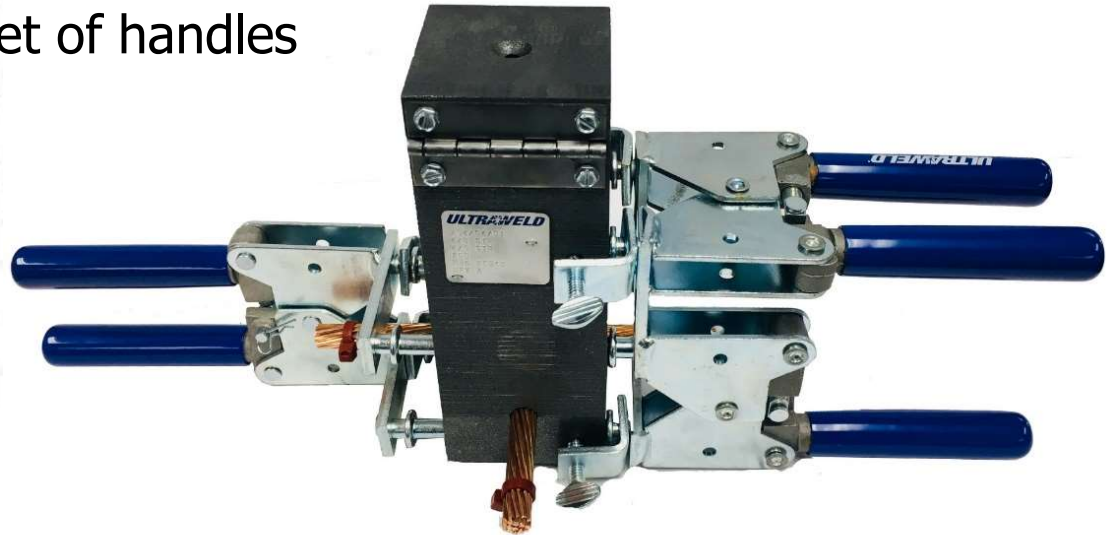
Common Obstacles

- Mold leaks weld metal
 - Mold worn out
 - Handles not closing all the way
 - Wrong mold for the application
 - Wrong conductors being used



Common Obstacles

- Mold is closed, but leaks after the shot is ignited
 - Cables prying mold open
 - Support cables
 - Use second set of handles



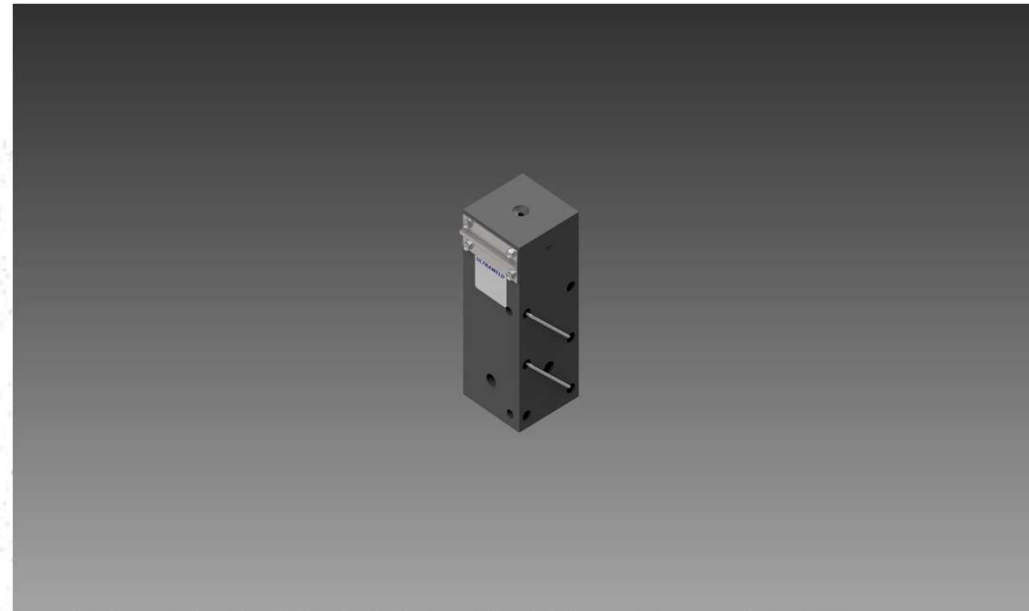
Common Obstacles

- Mold is closed, but leaks after the shot is ignited
 - Issues in video
 - Cables are not supported in a manner that removes tension from side to side
 - When the conductor is melted in half, the conductors pry the mold open
 - Weight on lid is not needed and may cause more issues



Productivity Enhancing Tools

- MH6/7 used on 3 Piece Molds
 - Easy to clean
 - High riser won't lock mold on connection
 - Easier to use than molds with frames





Productivity Enhancing Tools

- DroneKit Includes



DroneKit Case



DRONE



Battery Charger



Battery



Productivity Enhancing Tools

- UltraShot Storage Box



No. USBOXKIT



Productivity Enhancing Tools

- Ultraweld Mold Storage Box



No. UWMOLDBOX

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Productivity Enhancing Tools

- Mold Blanket



No. ULTRAWRAP

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Productivity Enhancing Tools

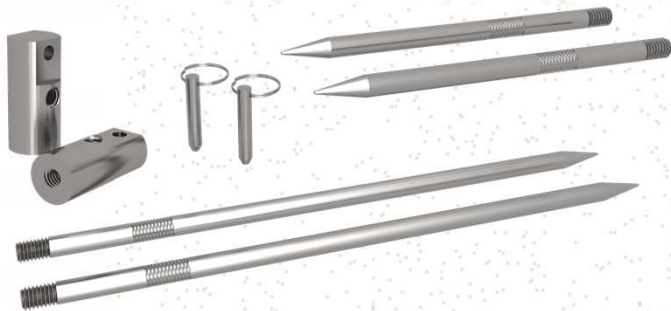
- Welding Blanket



No. WELDBKT

Productivity Enhancing Tools

- Mold Stabilization Spike Kit

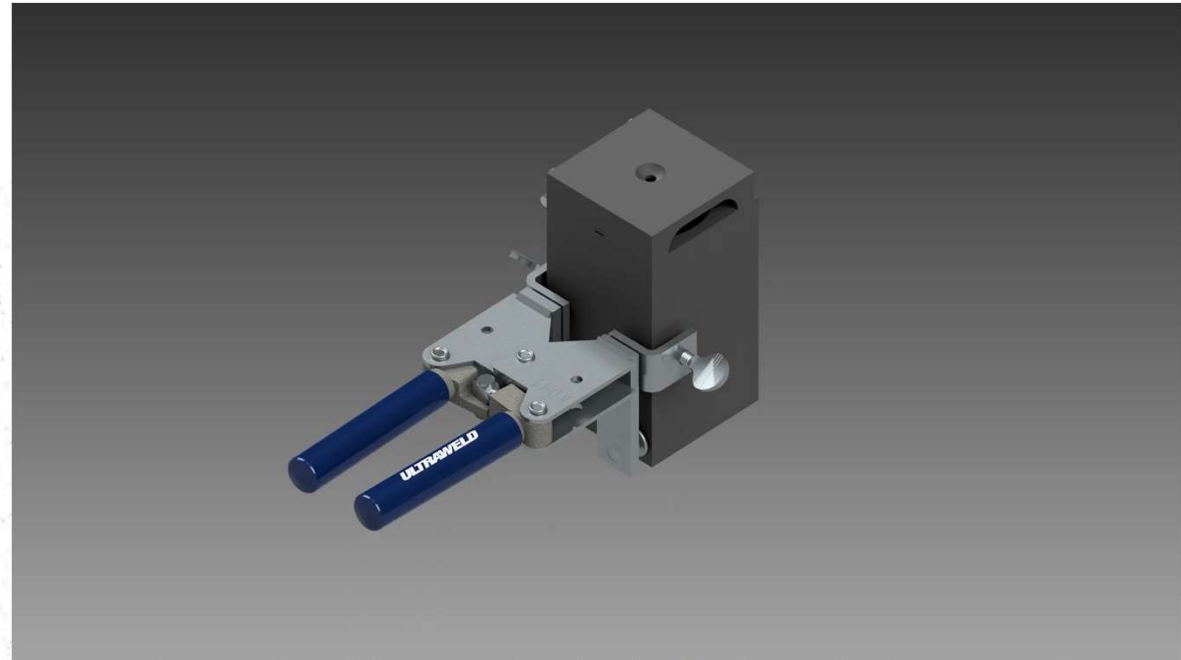
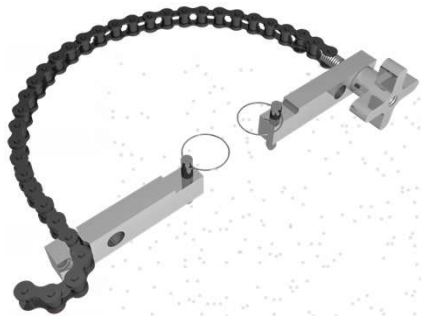


No. MLDSTBLZR

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Productivity Enhancing Tools

- Chain Supports

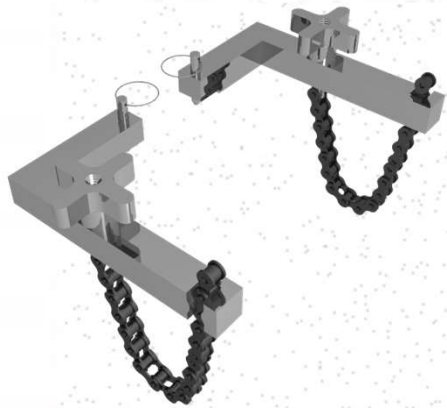


No. CSKIT Chain Support Kit



Productivity Enhancing Tools

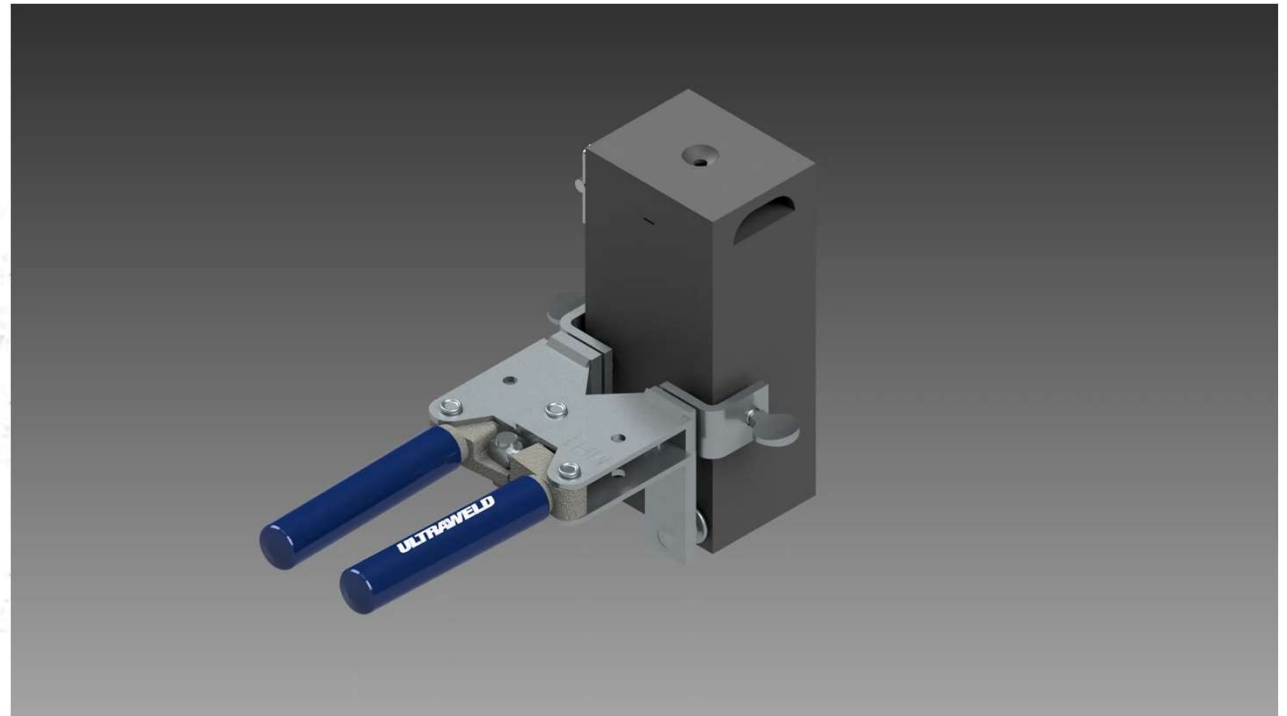
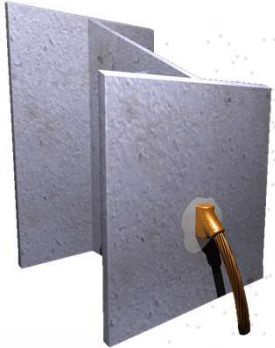
- Chain Supports



No. CSKITHPVS Chain Support Kit

Productivity Enhancing Tools

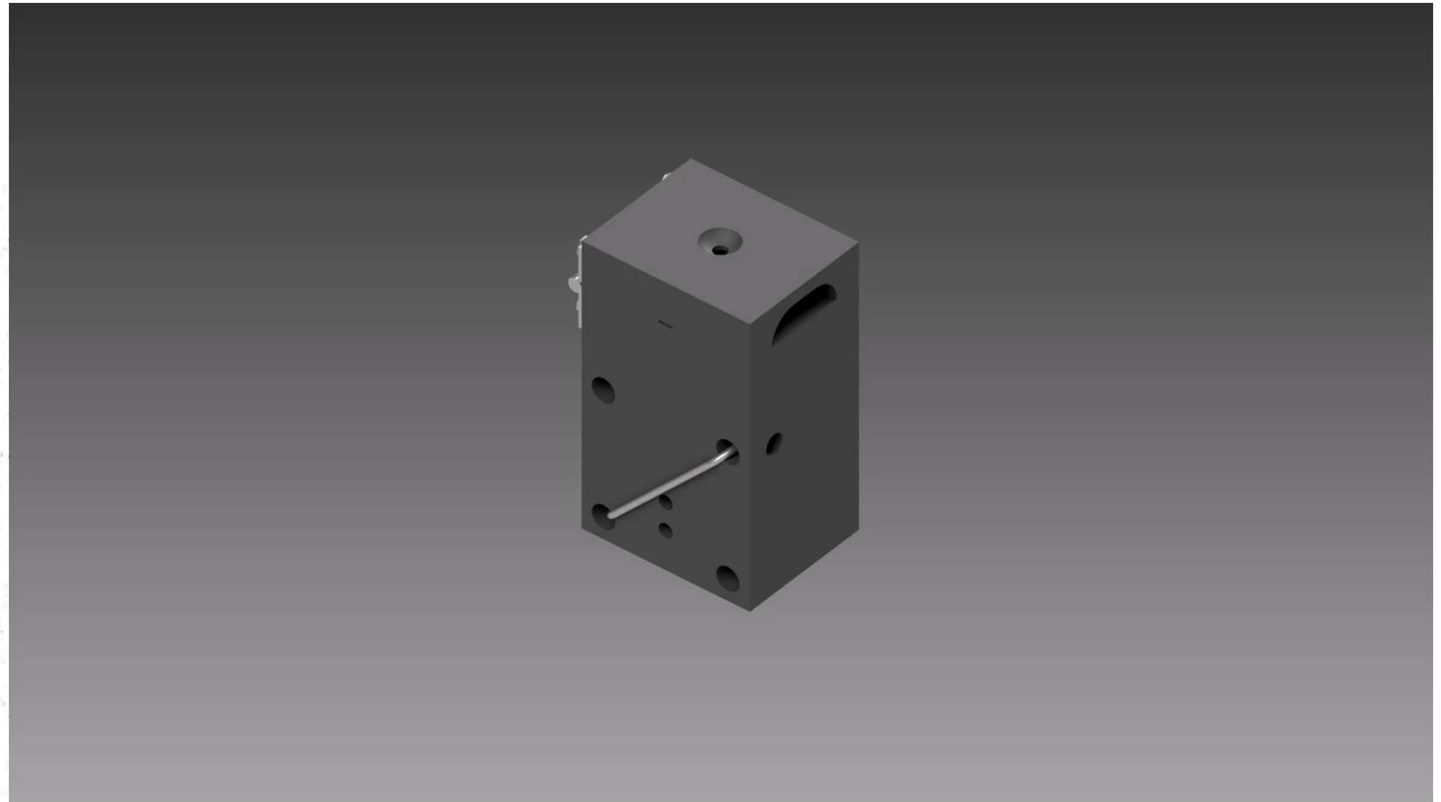
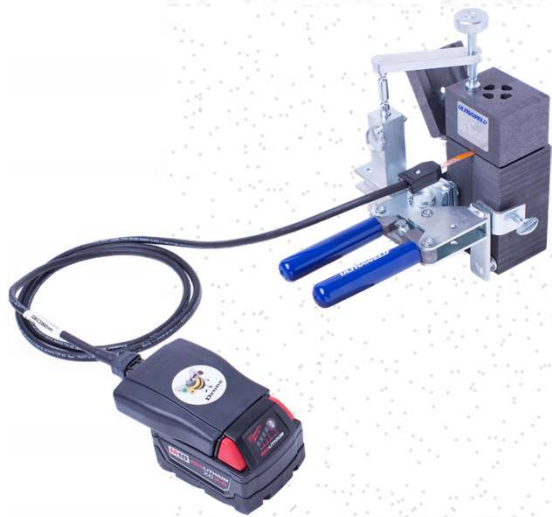
- Magnetic Supports



No. MSKIT Magnetic Support Kit

Productivity Enhancing Tools

LOSMOKE™





Making an Exothermic Welded Connection

Exothermic Connections

90% Preparation

10% Execution

Harger Ultraweld Exothermic Certification Quiz

Harger Ultraweld Exothermic
Certification Quiz



Thank You

HARGER[®]
Grounding - Exothermic - Lightning Protection

Manufacturer of

ULTRAWELD[®]

&

ULTRASHOT[™]

