

# Cast Iron Repair Kit Instructions

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## Metal Preparation

Thoroughly clean the cast iron surface. Remove all oil, grease, rust, paint, JB Weld, previous rod material, engine sealants, and contaminants. A bright, shiny surface created with a grinder or sanding disc provides optimal penetration and bonding.

If welding over an existing weld, completely remove the prior weld material. Electrodes perform best on clean, un-welded surfaces.

Be aware of engine sealants before welding, as they may contaminate the weld.

## Exhaust Manifold Note

Exhaust manifolds are exposed to constant heat cycling and carbon buildup. Take extra time to remove embedded carbon and old gasket material around flange surfaces. Any contamination left in the casting can cause porosity and repeat cracking.

## Engine Block Note

Engine blocks often contain oil saturation in the casting around cracks. Degrease thoroughly and, if necessary, gently heat the area to sweat out trapped oil before final cleaning. Any oil left in the casting will contaminate the weld.

## Bevel the Joint

- Bevel the joint before welding.
- Drill holes 1/2" from each end of the crack to stop crack propagation.
- Tack weld to retain alignment before completing the weld.

## Engine Block Crack Control

When repairing engine blocks, especially freeze cracks or external jacket cracks, drill stop holes carefully and do not drill into water jackets or internal passages unless required. Maintain wall thickness.

## Machine Setup

- Use **AC or DC reverse polarity (electrode positive)**.

## Amperage Guidelines

Rod Size	72 Burnt Cast Iron Electrode	77 Electrode
3/32" diameter	50-70	50-70
1/8" diameter	70-110	60-110
5/32" diameter	95-140	90-140

- If the rod undercuts, decrease amperage.
- If the rod appears ropey or does not penetrate, increase amperage.
- If penetration is insufficient, also check ground and machine settings
- Many welders prefer 3/32" rods to help maintain lower heat input.

## Welding Technique

- Maintain a short arc.
- Make short passes.
- Peen each pass promptly to remove slag before cooling.
- Continue back whipping and overlapping until deposits are fully connected.
- Cool naturally.
- Never weld more than 2 inches at a time.
- For some cast irons, weld 1 inch or less and allow 1 minute cooling between passes.
- Low and slow is the key to a sound cast iron weld.
- Never cool cast iron with water.
- Avoid welding in windy conditions.

## Exhaust Manifold Stress Control

Exhaust manifolds expand and contract repeatedly during operation. Excessive heat input during repair increases internal stress and can cause future cracking. Keep weld passes short and controlled. Do not overweld.

If the manifold is removed from the engine, weld with it supported in its natural position to prevent distortion. After welding, check flange surfaces for warpage before reinstalling.

Allow the manifold to cool slowly in still air, do not force cool. Inspect for additional hairline fractures before reinstalling.

## Engine Block Repair (No Disassembly Required if Accessible)

Engine blocks can often be repaired in place. If you can physically reach and properly prepare the crack area, you do not have to remove or disassemble the engine. Repair it without disassembly.

## In-Place Repair Guidelines

1. Disconnect battery before welding
2. Protect wiring, hoses, sensors, and fuel lines from welding spatter
3. Drain coolant if repairing water jacket areas
4. Degrease thoroughly – blocks are often oil-saturated
5. Gently heat the area to draw oil out of the casting before final cleaning
6. Weld in short sections to avoid heat distortion
7. Allow natural cooling between passes
8. Avoid overheating surrounding machined surfaces
9. Most engine block cracks are caused by freeze damage or stress fractures.
10. Keep heat low and controlled to prevent spreading the crack.

## After Repair

- Pressure test cooling system if applicable
- Inspect for seepage before returning to service
- Patience is critical when welding engine blocks.

## Preheating/Heat Management

- **Gently preheat the cast iron if possible.**
- It is not necessary to heat it red hot.
- Light preheating helps the bead lay flatter.
- Preheating removes moisture to prevent pinholes and porosity.
- Do not excessively heat or preheat cast iron. Cast iron welds are susceptible to cracking from rapid hot-to-cool temperature changes.

## TIG Welding

Soaking electrodes in water will help remove the coating for TIG welding.

Typical TIG Rod Selection:

- 3/32" rods for thinner cast
- 1/8" rods for heavier sections

Most TIG welders prefer 3/32" rods.

## Electrode Selection (72 vs 77)

### 77 Cast Iron Electrode

- Preferred when machining is required after welding.
- Good crack resistance.

### 72 Burnt Cast Iron Electrode

- Designed for anchoring into burnt cast iron.
- Use 72 first on heat-affected cast iron.
- Follow with 77 for crack-resistance and machinability.

## Repair Applications

- A mild steel patch may be used over large holes.
- 72, 75, and 77 electrodes will all bond steel to cast iron.
- If machining is required after welding, use the 77 electrode.
- Remove any JB Weld or previous rod before welding.

## Post-Weld Considerations

- Allow the weld to cool naturally.
- Do not force cooling, as rapid temperature changes may induce cracking.
- Inspect the repair for full deposit connection before proceeding with additional machining or finishing steps.

## **SAFETY GUIDELINES**

### **Respiratory Protection**

Use an air purifying dust respirator when welding or brazing in a confined space, or when local exhaust or ventilation is not sufficient to keep exposure values within safe limits.

### **Hands Protection**

Wear appropriate gloves to prevent skin contact.

#### **EN 12477: Protection gloves for welders**

Type B gloves are recommended when high dexterity is required as for TIG welding, while type A gloves are recommended for other welding processes. The contact temp (°C) is 100 and the threshold time (seconds) >15.


### **Eyes Protection**

Welder's helmet or face shield with color absorbing lenses. Shield and filter to provide protection from harmful UV radiation, infra red and molten metal approved to standard EN379. Filter shade to be a minimum of shade 9.

### **Skin Protection**

Heat-resistant protective clothing. Wear safety boots, apron, arm and shoulder protection. Keep protective clothing clean and dry. Clothing should be selected to suit the level, duration and purpose of the welding activity.

### **California Proposition 65**

 **WARNING:** This product contains chemicals including [Nickel], which are known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### **Ventilation**

Work in ventilated spaces to disperse flux fumes. Avoid confined areas without extraction.

## **Fire Safety**

Keep a fire extinguisher nearby when working around flammable surroundings.

## **Liability**

Follow AWS-compliant brazing safety standards.

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## **FIRST AID MEASURES**

### **Inhalation**

Remove to fresh air immediately or administer oxygen. Get medical attention immediately.

### **Skin**

Flush skin with large amounts of water and soap. If irritation develops and persists, get medical attention.

### **Eyes**

Flush eyes with water for at least 15 minutes. Get medical attention.

### **Ingestion**

Obtain medical attention immediately if ingested.

### **Electric Shock**

Disconnect and turn off the power. Use a non-conductive material to pull victim away from contact with live parts or wires. Immediately contact a physician.

## **FIREFIGHTING MEASURES**

### **Suitable Extinguishing Media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Welding arcs and sparks can ignite combustible and flammable materials. Use the extinguishing media recommended for the burning material and fire situation.

### **Unsuitable Extinguishing Media**

Do not use water on molten metal. Large fires may be flooded with water from a distance.

### **Specific Hazards Arising From Chemical**

Keep away from heat/spark/open flames/hot surfaces. No smoking. Hydrogen fluoride, Calcium oxide, Iron oxides, Carbon oxides, Strontium oxides, Manganese/manganese oxides, Barium oxide, Nickel/nickel oxides, Aluminum oxide, Sodium oxides, Silicon oxides

### **Protective Equipment**

Fire fighters should wear complete protective clothing including self-contained breathing apparatus.

## **ACCIDENTAL RELEASE MEASURES**

### **Cleaning Measures**

Solid objects may be picked up and placed into a container. Liquids or pastes should be scooped up and placed into a container. Wear proper protective equipment while handling these materials. Do not discard as refuse.

## **HANDLING AND STORAGE**

### **Precautions for Safe Handling**

Handle with care to avoid stings or cuts. Wear gloves when handling welding consumables. Avoid exposure to dust. Do not ingest. Some individuals can develop an allergic reaction to certain materials. Retain all warning and identity labels.

### **Conditions for Safe Storage**

Store in dry place in closed packages. Keep separate from chemical substances like acids and strong bases, which could cause chemical reactions. Ground/bond container and receiving equipment.

## **EXPOSURE CONTROLS/ PERSONAL PROTECTION**

### **Engineering Controls**

Avoid exposure to welding fumes, spatter, electric shock, heated materials and dust. Ensure sufficient ventilation, local exhaust, or both, to keep welding fumes and gases from breathing zone and general area. Keep work place and condition of protective clothing clean and dry. Train welders to avoid contact with live electrical parts and insulate conductive parts. Check condition of protective clothing and equipment on a regular basis.

### **Exposure Limits**

Use industrial hygiene equipment to ensure that exposure does not exceed applicable national exposure limits. Unless noted, all values are for 8 hour time weighted average.

### **Biological Limits**

No available data