OVERVIEW

TIG welding, also known as Gas Tungsten Arc Welding (GTAW), is a versatile welding process used to join various metals. This step-by-step guide will help you understand the basic setup and technique for TIG welding.

PARTS

A. TIG Torch:
The TIG torch is the handheld device that holds the tungsten electrode and delivers the welding current to the workpiece.

B. Tungsten Electrode:
The tungsten electrode is a non-consumable electrode used in TIG welding. It withstands high temperatures and provides the electric arc for the welding process.

C. Torch Collet and Collet Body:
The collet and collet body hold the tungsten electrode securely in place within the TIG torch. They provide electrical contact and help direct the shielding gas flow.

D. Nozzle:
The nozzle, also known as the gas cup, surrounds the tungsten electrode and helps to direct the flow of shielding gas onto the weld zone. It protects the arc and molten weld pool from atmospheric contamination.

E. Gas Lens:
The gas lens is an optional component that fits inside the nozzle. It helps to distribute the shielding gas evenly and improve gas coverage.

F. Filler Rod:
The filler rod is often used to add material to the weld joint. It is manually fed into the welding pool to build up the weld and maintain the desired size and strength.

G. Gas Regulator/Flowmeter:
The gas regulator or flowmeter is used to control and measure the flow rate of the shielding gas. It ensures a consistent and appropriate flow during the operation.

PARTS (continued)

H. Foot Pedal/Hand Control:
TIG welding often utilizes a foot pedal or hand control device to regulate the welding current. This allows the welder to have precise control over the heat input during welding.

I. Ground Clamp:
The ground clamp connects the workpiece to the welding power source, completing the electrical circuit. It ensures proper grounding and electrical safety during the process.

J. Power Source:
The power source provides the electrical current necessary for TIG welding. It typically includes controls for adjusting parameters such as current, voltage, and pulse settings.

K. Shielding Gas Hose:
The TIG torch is connected to a shielding gas supply through a hose. The most commonly used shielding gases in TIG welding are argon and helium, or a mixture of both.

PROCEDURE

1. Safety first
Wear appropriate personal protective equipment (PPE), including TIG gloves, an auto-darkening helmet, and a welding respirator if necessary. Ensure proper ventilation in the welding area to avoid gas coverage issues and fumes.

2. Familiarize yourself with the equipment
Different TIG machines may have various features, so it's essential to understand your specific machine. Learn the differences between TIG machines and other welding processes like MIG and Stick welding. Identify the components of the TIG torch, including the tungsten, cups, and gas flow controls.

3. Clean the workpiece
Remove any mill slag, rust, or paint from the metal using a grinding wheel. Clean the workpiece thoroughly to remove any dirt, rust, or contaminants. Use a wire brush or suitable cleaning solution for this purpose. Securely clamp the workpiece to a welding table or fixture to keep it stable during the welding process.

4. Set up the welding machine
Place the TIG welding machine on a stable work surface and connect it to a power source. Ensure the gas supply (typically argon) is connected to the machine and turned on. Use 100% pure argon gas for TIG welding. Set the gas flow to approximately 15-20 cubic feet per hour (CFH). Ensure you have a proper gas regulator or flow meter to control the gas flow accurately.

5. Assembly of the torch cups
Familiarize yourself with the torch components and their functions. Learn how to disassemble and reassemble the torch for easy tungsten replacement and cup changes. Practice handling the torch safely and ensure it is comfortable to hold.

6. Prepare the tungsten electrode
Choose the appropriate type of tungsten electrode (blue or gray) based on your welding requirements. Attach the tungsten electrode securely to the TIG torch using the collet and collet body. Use a dedicated grinding stone for tungsten electrodes and maintain a clean grinding surface and grind the electrode to create a pointed tip. Avoid spiral grinding, as it may cause circular lines on the tungsten, leading to an irregular arc. Hold the tungsten steady and grind it at a steep angle to create grinding lines that go down towards the tip.

7. Ground clamp and torch connections
Connect the ground clamp to the positive terminal of the TIG machine. Connect the TIG torch to the negative terminal. Ensure a secure connection to maintain proper electrical conductivity. Adjust the amperage on the TIG welding machine according to the thickness of the metal being welded. Consult the welding machine's manual for specific guidelines. Set the gas flow rate to ensure adequate shielding of the weld pool.

8. Positioning the ignition
Position the welding torch at a 10-15 degree angle from the workpiece and hold it with a comfortable grip. Touch the tungsten electrode to the workpiece to initiate the arc. Maintain a suitable arc gap (around 3/16 inch) and travel down the metal at a 15-degree angle. Depress the foot pedal or switch to initiate the gas flow and start the welding arc.

9. Welding Technique
With the arc initiated, gently touch the tungsten electrode to the workpiece, creating a small molten puddle. Once the puddle is formed, slowly and steadily move the torch along the joint, adding filler metal if necessary. Maintain a consistent arc length, typically around 1/8 inch (3mm), and a steady travel speed to ensure a smooth and even weld bead.

10. Fill and complete the weld
Lift the torch quickly and at an angle to break the arc. Move the torch back closer to the workpiece without touching it. Maintain the shielding gas flow for a few seconds to cool the weld and ensure proper gas coverage. Continue welding along the joint until the desired length or area is covered. When you reach the end of the weld, gradually reduce the amperage to allow the weld pool to solidify before removing the torch. Allow the welded workpiece to cool down naturally.

11. Practice and refinement
Continue practicing TIG welding techniques to improve your skills. Experiment with different settings, materials, and welding positions to broaden your knowledge. Seek further guidance or take welding classes to refine your TIG welding abilities.

8. Post welding clean up
Once the weld has cooled, inspect it for any defects or imperfections. If necessary, use appropriate tools to grind or clean the weld for a finished appearance.

NOTE
Remember, TIG welding requires patience, precision, and practice. By following these steps and investing time in practicing, you can become proficient in TIG welding and expand your welding capabilities. It's essential to familiarize yourself with the specific TIG welding machine you are using and follow the manufacturer's instructions for safe and efficient operation.